

AUSTRALASIAN MEDICAL CONGRESS.

TRANSACTIONS,
NINTH SESSION.

VOL. II.
SYDNEY, 1911.



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(Formerly the Intercolonial Medical Congress of Australasia).

TRANSACTIONS OF THE NINTH
SESSION

HELD IN

SYDNEY, NEW SOUTH WALES,

SEPTEMBER, 1911.

F. ANTILL POCKLEY, M.D., PRESIDENT.

IN TWO VOLUMES.

VOL. II.

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(Twenty-First Annual Meeting, Sydney, 1901)

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VII.

SECTION OF OPHTHALMOLOGY.

PRESIDENT'S ADDRESS.

The Wassermann Reaction Results in the Victorian Eye and Ear Hospital for a year.

By J. W. BARRETT, M.D., M.S. (Melb.), F.R.C.S. (Eng.).

IN the first instance, I have to express my sincere thanks to the officers of the Australasian Medical Congress, who have done me the great honour of inviting me to act as President of the Section of Ophthalmology. The compliment has been keenly appreciated by my colleagues at the Victorian Eye and Ear Hospital, and myself, and in return we have done our best to produce work worthy of the occasion.

Whatever may be your verdict on that which we now beg to submit to you, we can simply produce it as the best we could do. Although I am in the position in which you have been kind enough to place me—delivering a Presidential address—nevertheless, I am simply putting into words the results of a year's systematic work done at the Victorian Eye and Ear Hospital in the clinic of Dr. Orr and myself, loyally supported by Drs. M. Lynch and Reid, clinical assistants; Dr. Rosenfield, anæsthetist; Dr. Eileen Fitzgerald, pathologist; and the resident staff of the hospital, notably Dr. Parnell and Dr. Sweet.

Before placing the facts which have been gathered together before you, a brief résumé of the history of the subject-matter is necessary. The profound belief of the great majority of ophthalmologists in the widespread dissemination of syphilis has long been a feature of medical practice; so much so, that Gowers is reported to have referred to the faith of the oculist in mercury, and it will be remembered that at the last session of the Congress held in Melbourne, prolonged debates took place on this subject of the dissemination of syphilis. It became obvious that the pathologist who examined the bodies of those who die, and the ophthalmologist who examined the retina and choroid of patients during life, were much stronger in their expressions of opinion than the physicians and the majority of surgeons, but were supported by many of those whose practice lay amongst children. It will be further remembered that the mode of reasoning adopted by the ophthalmologist and pathologist was some-

what as follows:—In certain cases, which are known to be syphilitic, certain definite appearances are found. Such cases are usually manageable under anti-syphilitic treatment. If then during life we find these appearances, but for various reasons can obtain no history of syphilis, and if we find that these conditions are manageable by anti-syphilitic treatment, we can, therefore, assume that the conditions are always syphilitic. Likewise, the pathologist, finding after death certain appearances in cases known to be syphilitic, assumed that all such appearances were so caused. It may be remembered that this position was challenged, and that those of us who took this view were informed that it was obligatory on us to show that other unknown causes could not produce these appearances. The resolution finally carried at the full meeting of the Congress was as follows:—"That syphilis is responsible for an enormous amount of damage to mankind, and that preventive or remedial measures directed against it are worthy of the utmost consideration."

This resolution was presented to the Government of Victoria, accompanied very properly by the statement that there was a considerable and sharp difference of medical opinion respecting the extent of distribution of the disease. The Government consulted its Principal Health Officer, Dr. Burnett Ham, and asked him what he thought about the matter. He replied that, in view of the difference of opinion which existed, he was unable to decide, but he advised that the Government should for one year authorise him to undertake a collective investigation into the distribution of syphilis, with the aid and co-operation of the medical profession in Victoria. He pointed out that the technique of the Wassermann method of diagnosis was now established; that we had in Melbourne Dr. Konrad Hiller, who was familiar with the method; and that it would be quite a simple matter to make syphilis a notifiable disease for twelve months, and to get the blood of every patient examined. The Government authorised Dr. Ham to take these steps, and syphilis was made a compulsory notifiable disease in an impersonal manner from the 1st June, 1910, until the 31st May, 1911, within the Victorian metropolitan area. Medical men were instructed to report each case, and to send a specimen of the blood to the Bacteriological Laboratory of the University, where it was examined by Dr. Hiller, and a report sent to the practitioner stating the result of the examination.

The following conditions were suggested as probably being syphilitic, and of being worthy of report:—

1. Primary lesions.
2. Secondary lesions.
3. Tertiary lesions, including gummata, ulcers, fibrosis, eruptions, bone diseases, eye diseases, &c., of certain or doubtful syphilitic origin.
4. All cases of thoracic aneurism, aortic retroversion.
5. All cases of apoplexy in young subjects.

6. All cases of locomotor ataxy, and general paralysis of the insane.
7. Congenital and infantile syphilis.
8. All cases in which a mother—
 - (a) gives birth to a syphilitic child;
 - (b) has suffered from two abortions;
 - (c) has lost three children from disease under 5 years of age.
9. Any other suspicious cases.

The profession responded on the whole well, considering the troublesome nature of blood collection, and 5,500 cases were reported during the twelve months. Of these, about 900 came from the Melbourne Hospital, and about 1,100 were collected at the Eye and Ear Hospital by the gentlemen named, and in our own private practice; so that 3,500 cases were sent by practitioners in general. The general aspect of the matter will, however, be dealt with in other sections, and it will be my business to-day to try and indicate the special bearing of this problem on ophthalmology, and from the results obtained to indicate some of the larger problems suggested by the inquiry.

Prior to the commencement of the period beginning 1st June, 1910, a number of isolated cases were examined, and in some the results were so remarkable as to give a serviceable guide for the more extensive operations. Shortly, the examination has been divided into several groups. For the whole twelve months, 197 cases of eye disease were examined in private practice; that is, 197 cases of which there was some suspicion respecting causation. As the year went on, the area of suspicion widened, and many cases were examined towards the close, which would not have been examined at the outset. During the same period, 158 cases of ear, nose, and throat disease were examined in private practice in like conditions. In hospital practice, to a very great extent, the eye cases, and the ear, nose, and throat cases were completely separated; the eye cases attending on Mondays and Thursdays; the ear, nose, and throat cases on Tuesdays and Fridays; and for the first eight months of the period—that is, for the period ending 31st January, 1911—only suspicious cases were reported. During the eight months, 117 eye cases were reported, and 23 ear, nose, and throat cases. By this time, however, the results which had been obtained were of so remarkable a character that we consulted Dr. Ham respecting the possibility of obtaining an estimate of the distribution of syphilis throughout the entire population of the State, and with his sanction conducted an experimental investigation at the Victorian Eye and Ear Hospital on the following lines:—For the four months beginning 1st February, 1911, and ending 31st May, 1911, all cases which visited the hospital on Monday and Thursday afternoon, and Tuesday and Friday afternoon, were submitted to the Wassermann test, irrespective of disease or injury, for which they sought admission. During that period 360 cases of eye disease,

and 53 cases of ear, nose, and throat diseases were submitted to examination. Before proceeding to deal with these facts in detail, some reference to the method is necessary.

The technique will be fully described in other sections of the Congress, but the question naturally arises, whether in such a comprehensive investigation, in which the pressure on those who were conducting the investigation was so great, and in which the sources of supply were so diverse, errors may not have been made. I think you will agree with me that apart from the personal confidence that practitioners have in Dr. Hiller's work, that the internal evidence afforded by the figures the results give, and under different conditions, is, perhaps, the best evidence of its essential soundness. There arises, however, the larger question: whether the Wassermann test is an unfailing test for syphilis. Tripanosomiasis is practically unknown in Australia. None of our cases suffered from acute exanthems, but two somewhat suspicious and striking features of the inquiry are the number of positive results obtained in trachoma and cancer. These are usually interpreted, and probably rightly, as indicating that the lowered resistance produced by syphilis led to obstinate trachoma or to cancer, but it also raises just the shadow of a speculative doubt whether trachoma and cancer, in common with syphilis, may not be protozoal diseases, and give a common reaction. It is not in the least likely, but the possibility should be borne in mind.

Dr. Ham associated with himself an advisory committee, which consisted of Professor Allen, Dr. K. Hiller, Dr. Stawell, Dr. Bull, Dr. A. J. Wood, and the writer; and in the report to the Government we assumed that on the average six cases of positive Wassermann reaction meant ten cases of syphilis. As I shall show somewhat later, I think that this is probably a considerable underestimate.

I propose now to examine the evidence in detail, and, in the first instance, to refer to the suggestive results obtained prior to the commencement of the general investigation.

A man aged 26 years had marked nervous deafness; he had suffered from ophthalmia at the age of 8. In the right cornea were old blood vessels due to trachoma and interstitial keratitis. In the left eye, due to interstitial keratitis alone. His father died at 68 years of age. The mother and three sisters were alive. One sister died aged 1 month, who would have been older than the patient. Another, who would have been younger than the patient, died at 7 days. Here was clearly a case of interstitial keratitis in childhood almost certainly specific, as it was associated with nervous deafness, but the Wassermann reaction was negative. (2) A girl, aged 19 years, was taken to the Eye and Ear Hospital suffering from albuminuric retinitis, and a high blood pressure, 180 mm. She had albuminuria, and died of heart failure. She was the oldest child of the marriage, but there had been one miscarriage before her birth. Both the patient and three younger brothers gave negative reactions, but the reaction of the mother was positive.

PLATE I.

EYE CASES SEEN IN PRIVATE PRACTICE DURING TWELVE MONTHS, FROM
1ST JUNE, 1910, TO 31ST MAY, 1911.

RESULTS.

Disease.						Negative.	Positive.	Partial.
Conjunctivitis	...	...	...	...	...	3	...	...
Trachoma	...	...	...	...	...	6	1	4
Corneal opacities	...	...	...	...	...	5	1	1
Interstitial keratitis	{	Acute	...	...	...	3	1	1
		Old	...	...	...	4	...	2
Iritis	{	Acute	...	...	...	1	2	...
		Old	...	...	...	6	1	...
Cataract	...	...	...	...	...	5	3	1
Vitreous] opacity	{	Fine	...	...	...	1	1	1
		Gross	...	...	...	12	...	1
Choroiditis	{	Peripheral	...	...	...	3	...	...
		General	...	...	...	12	3	1
Neuritis	...	...	...	...	...	1	...	...
Retro-bulbar neuritis	...	...	...	...	...	1	1	...
Retinis hæmorrhagica	...	...	...	...	...	1	1	...
„ pigmentosa...	...	...	...	...	...	1	...	...
Detached retina	...	...	...	...	...	5	...	...
Locomotor ataxia	...	...	...	...	...	...	1	...
Arterio-sclerosis	...	...	...	...	...	8	3	...
Albuminuria	...	...	...	...	...	...	...	1
Glaucoma	...	...	...	...	...	2	...	...
Paresis eye muscles	...	...	...	...	...	1	...	1
Asthenopia (neurasthenia)	...	...	...	...	...	12	5	1
Astigmatism	...	...	...	...	...	22	...	3
Myopia	...	...	...	...	...	14	1	1
Rheumatoid arthritis	...	...	...	...	...	...	1	...
Family history	...	...	...	...	...	4	3	1
Miscellaneous	...	...	...	...	...	13	...	2
						146	29	22

Total—197 cases, of which 29 gave a positive and 22 a partial result.

PLATE IA (CHOROIDITIS).

Age.	Result.	Nature of Choroiditis.
25	—	Slight peripheral, R. and L.
45	—	Slight macular (one-sided).
34	—	Temporal side of right retina.
50	—	Diffused pigmented areas, R. and L.
32	—	One central and one peripheral patch, L. side.
39	—	Disturbance pigmentation temporal region, L.
9	—	One white spot near centre and one at periphery, R. side.
38	—	Macular degeneration, R.
27	+	Small patch near centre, R. and L.
50	—	Pigmentation both eyes, R. disc pale. History, 20 years.
47	—	Minute choroidal changes, R. and L.
34	—	Small yellow spot below the disc.
15	—	Myopia nystagmus.
24	—	Hyperopia nystagmus.
16	—	Disseminated, R. and L.
50	—	Pigmentation macular, R. and L.
50	—	Myopic choroiditis, R. and L.

PLATE IB (VITREOUS OPACITIES).

Age.	Result.	Nature of Opacities.	Other conditions.
64	—	Fine, R. side ...	Peripheral choroiditis.
33	—	Fine, R. and L. ...	Dark retinal patch near disc.
45	—	Fine, R. side ...	Myopia—diabetes.
34	—	Fine—R. side ...	Old keratitis choroiditis.
58	—	Fine, R. ...	Nebular corneæ.
74	—	Coarse R. Fine Vit op. L.	
29	+	Dust, L. ...	R. punctata.
49	+	Few fine, L. ...	Post synech, R.; few spots post surface of cornea, L.
55	—	Few fine, R. and L.	
70	—	Few fine, R. ...	Large corneal opacity, L.
52	—	Fine and gross, R.	
48	—	Few fine, R. and L.	
33	—	Few fine, R.	
36	+	Dusty, R.	
66	—	Fine, R. and L. ...	Hæmorrhages in fundus.
50	—	Fine, R. and L. ...	Arterio-sclerosis.
50	—	Coarse, R. and L. ...	Myopia.
54	—	Coarse, R. and L. ...	Arterio-sclerosis.

Plate I shows the result of the cases of ophthalmic diseases seen in private practice during the twelve months referred to, and which were sufficiently suspicious to warrant report.

First and foremost will be noticed the relatively large number of cases of trachoma which gave positive or partially positive reaction, a result which has occurred in every investigation we have made. Next that, contrary to expectation, a considerable number of cases of interstitial keratitis gave a negative reaction. They were for the most part mild cases. An attempt has been made to give a general classification of choroiditis and of vitreous opacities, but it is unsatisfactory, and requires the special analysis which is subjoined.

Amongst other items of interest will be noted the large proportion of positive results in arterio-sclerosis, and in what is usually termed asthenopia, but which really means people with a small error of refraction who were obviously neurasthenic—in fact, chronic neurasthenia has so often been associated with submerged syphilis in my experience that I invariably cause a Wassermann determination to be made. The entry, "Family History," means that certain other members of the family besides the patient were examined in certain doubtful cases.

Included in this list are some cases of remarkable interest. One of the cases refers to a patient, aged 64, who had opacities of the cornea of one eye throughout life, cause unknown, and has large vitreous opacities and lenticular opacities in the other eye. The result of the examination was a partial reaction. He has, however, two sons, aged 12 and 15 respectively, one of whom suffers from slight attacks of petit mal, is flabby, overgrown, and progressively myopic, and has had several attacks of middle ear disease. The Wassermann reaction in the case of the children is negative, and, but for the Wassermann examinations of the father, the possible cause would never have been detected.

Another patient, aged 45, consulted me for refractive error. There was some disturbance of the retina in the macula region. An examination was made, and a partially-positive result obtained. His wife and child were suffering from anæmia, which almost bordered on the graver forms, but which ended in complete recovery under suitable treatment.

Noteworthy, too, is the case of a child, aged 2·5 years, who was brought suffering from a severe keratitis which involved nearly the whole of the cornea, leaving a clear zone of cornea at the periphery. As the examination could only be made under general anæsthetic, it remained a matter of doubt whether the lens was not forward in the anterior chamber producing this appearance. Careful examination showed that it was a case of keratitis. The mother and father were examined, and negative results were obtained. The child gave a negative result, but an older brother gave a positive result. The case is doing well under anti-specific treatment.

Noteworthy, also, is another case, where a brother and sister in a family are ametropic.

The brother gave a positive and the sister a partially positive result.

Instructive, too, is the case of a man aged 77, who gave a positive reaction, and who was successfully operated on for cataract in the left eye. The right eye had been lost after cataract extraction before the Wassermann method was known, and I may anticipate to say that we have evidence that a number of cases of iritis and destruction after cataract occur in those who are syphilitic. As showing the danger of interpretation, may be mentioned another case of a patient who has been under observation for eight years. When first seen the patient was aged 23. There was choroidal disturbance in the one eye, and dust-like vitreous opacities in both eyes. Anti-specific treatment has been pursued more or less during the whole period; but, notwithstanding, several attacks of iritis have occurred.

Four examinations of the blood have been made, three of which gave a negative result, and one a partially positive. It is the existence of a number of cases of this type that have led to the conviction that the partially positive cases, as well as many of the negative cases, are undoubtedly syphilitic.

A typical case is that of a woman of 40, who has been under observation for years, complaining of anomalous eye symptoms, asthenopia, and, more lately, monocular diplopia. She is somewhat anæmic. The continued and intangible nature of her complaints ultimately led to an examination of the blood being made, the result being positive.

The method also has the advantage that with those who desire it it may be used for purposes of social diagnosis. In one instance, a young woman who had suffered from anomalous eye and throat symptoms finally made her appearance with neuritis of the arm. An examination of the blood of the mother and daughter resulted in a negative result in the former, and a positive result in the latter case.

PLATE 2.

EAR, NOSE, AND THROAT CASES SEEN IN PRIVATE PRACTICE DURING THE TWELVE MONTHS COMMENCING 1ST JUNE, 1910, AND ENDING 31ST MAY, 1911.

RESULTS.

Diseases.	Negative.	Positive.	Partial.
Deafness (a) Unclassified	8	1	1
„ (b) C.C.M.E.	41	3	1
„ (c) Nervous	2	...	...
Deaf mute ... ..	...	1	...
C.S.C.M.E.	6	...	1
Patent nose	4	...	...
Atrophic rhinitis	9	...	...
Necrosis bones of nose ... ..	...	2	...
Perforated septum	1	...	...
Septal deviation	3	...	3
Maxillary antral disease	8	...	1
Post-nasal adenoids	3	...	...
Catarrh, nose and throat	8	...	...
Tonsils	3	3	...
Perforated palate ... ..	...	1	...
Tumour, upper jaw ... ..	...	...	1
Enlarged cervical glands	2	1	...
Exophthalmic goitre	3	...	...
Bulbar paralysis ... ..	...	1	...
Family history	2	...	1
Larynx catarrh	6	2	2
„ ulceration ... ..	...	1	...
„ neoplasm ... ..	...	...	1
„ epithelioma ... ..	...	...	1
Miscellaneous	13	4	1
	122	20	14

Total—158 cases, 20 of which gave a positive and 14 a partial reaction.

Plate 2 hardly concerns this section, but it is interesting as showing that atrophic rhinitis is probably never syphilitic. The findings with respect to the malignant conditions of the larynx are also profoundly important. It is worth a passing notice as showing how it is that cancer curers occasionally obtain wonderful results.

PLATE 3.

CASES OF EYE DISEASES EXAMINED AT THE VICTORIAN EYE AND EAR HOSPITAL, FROM 1ST JUNE, 1910, TO 31ST JANUARY, 1911.

RESULTS.

Diseases.						Negative.	Positive.	Partial.
Conjunctivitis	...	...	...	...	...	2	...	...
Trachoma	...	...	...	...	...	1	...	...
Interstitial keratitis	{	Acute	...	...	...	11	9	3
		Old	...	...	...	...	1	1
Cyclitis descemetitis	...	...	...	...	...	...	5	1
Iritis	{	Acute	...	...	...	3	10	3
		Old	...	...	...	...	...	...
Cataract	{	Congenital	...	...	...	1	1	...
		Senile	...	...	...	2	...	...
Vitreous opacities	...	...	...	...	...	1	1	...
Choroiditis	...	...	...	...	...	4	8	...
Neuritis	...	...	...	...	...	...	1	...
Retro-bulbar neuritis	...	...	...	...	...	1	...	...
Retinitis hæmorrhagica	...	...	...	...	...	1	...	1
„ pigmentosa	...	...	...	...	...	2	1	...
Optic atrophy	...	...	...	...	...	...	2	...
Obstruction, retinal artery	...	...	...	...	...	...	2	...
Scleritis	...	...	...	...	...	2	...	...
Sympathetic ophthalmitis...	...	...	...	...	...	4	...	...
Paralysis ocular muscles	...	...	...	...	...	4	2	...
Family history	...	...	...	...	...	1	2	1
Miscellaneous	...	...	...	...	...	18	3	...
						58	49	10

Total—117 cases, of which 49 gave a positive and 10 gave a partial reaction.

Plate 3 shows the result of examination of ophthalmic cases in hospital practice for the eight months ending 31st January, 1911. It will be noted that of the 117 cases examined, 49 gave positive reaction, and 10 gave partial reaction; or, if the proportion of 6 to 10 be admitted, about 85 of the 117 cases were undoubtedly syphilitic. This high proportion is clearly due to the fact that at the hospital only the obvious cases were reported, whereas the finer discrimination and more complete examination in private practice resulted in a more extensive trial being made. Running down the list, it will be noted that only one case of trachoma was examined;

that more than half the cases of interstitial keratitis gave some reaction; that cyclitis and descemetitis was undoubtedly specific; the majority of the cases of iritis were syphilitic; and it will be noted that cases of scleritis and sympathetic neuritis were not syphilitic.

During the same period, twenty-three cases of ear, nose, and throat disease were examined.

PLATE 4.

CASES OF EAR, NOSE, AND THROAT DISEASE EXAMINED AT THE VICTORIAN EYE AND EAR HOSPITAL, FROM 1ST JUNE, 1910, TO 31ST MAY, 1911.

RESULTS.

Diseases.						Negative.	Positive.	Partial.
C.C.M.E.	...	...	...	...	...	1	1	...
Nerve deafness	...	...	...	...	...	...	1	...
Mastoiditis	...	...	...	...	...	1	...	...
Atrophic rhinitis	...	...	...	...	...	3	1	...
Nasal ulceration	...	...	...	...	...	1	1	...
Deviation septum	...	...	...	...	...	1	1	...
Perforation septum	...	...	...	...	...	1	...	...
Hypertrophied turbinates	...	...	...	...	...	1	...	...
Tonsils	...	...	...	...	...	1	...	...
Maxillary antral disease	...	...	...	...	...	2	...	...
Perforation palate	...	...	...	...	...	...	1	...
„ soft palate	...	...	...	...	...	1	...	...
Ulceration palate	...	...	...	...	...	...	1	...
„ pharynx	...	...	...	...	...	1	...	...
Deaf mute	...	...	...	...	...	1	...	...
Backward in speech	...	...	...	...	...	...	...	1
						15	7	1

Total—23 cases, of which 7 gave a positive and 1 a partial reaction.

It will be obvious that in all the figures so far adduced, the percentage of results is only of value as showing how far the judgment of the practitioner has been accurate—that is to say, that certain cases were thought to be syphilitic, and on being tested were found in the majority of cases to be so; and, as far as it went, more than justified the attitude previously taken up on clinical evidence alone. But from 1st February, 1911, every case was examined, no matter what disease, and it is this concluding period of four months that furnishes such remarkable evidence.

PLATE 5.

OUT-PATIENT CASES OF EYE DISEASE EXAMINED AT THE VICTORIAN EYE
AND EAR HOSPITAL, FROM 1ST FEBRUARY TO 31ST MAY, 1911.

RESULTS.

Diseases.						Negative.	Positive.	Partial.
Conjunctivitis	...	...	...	...	...	44	2	4
Trachoma	...	...	...	...	...	15	2	2
Corneal opacities	...	...	...	...	...	3	1	...
Spring catarrh	...	...	...	...	...	2	...	...
Meibomian cysts	...	...	...	...	...	6	...	...
Pterygium	...	...	...	...	...	5	...	...
Corneal ulcer	...	...	...	...	...	10	...	1
Plyctenules	...	...	...	...	...	3	1	...
Socket cases...	...	...	...	...	...	4	2	...
Interstitial keratitis	...	...	...	...	...	8	3	...
Iritis { Acute	...	...	...	...	...	3	4	1
Iritis { Old	...	...	...	...	...	2	1	...
Kerato iritis...	...	...	...	...	...	3	1	1
Cyclitis descemetitis	...	...	...	...	...	2	...	...
Cataract	...	...	...	...	...	14	3	2
Choroiditis	...	...	...	...	...	4	1	3
Retinitis pigmentosa	...	...	...	...	...	1	...	...
Neuro retinitis	...	...	...	...	...	1	...	...
Optic atrophy	...	...	...	...	...	...	...	2
Paresis eye muscles	...	...	...	...	...	3	...	1
Glaucoma	...	...	...	...	...	3	...	1
Strabismus	...	...	...	...	...	16	...	1
Ametropia	...	...	...	...	...	114	3	1
New growths	...	...	...	...	...	2	...	...
Injuries	...	...	...	...	...	24	...	1
Rheumatoid arthritis	...	...	...	...	...	1	2	...
Tubercular meningitis	...	...	...	...	...	...	1	...
Miscellaneous	...	...	...	...	...	16	3	...
						309	30	21

Total—360 cases, of which 30 gave a positive and 21 a partial reaction.

Plate 5 shows the result of the examination of all the ophthalmic cases treated during that period, and certain conspicuous features will be noted on looking down the table. In the first place, a percentage of cases of conjunctivitis give positive and partial results; that out of 19 cases of trachoma, 2 gave positive and 2 partially positive results; that 11 cases of interstitial keratitis gave 3 positive results; that out of 8 cases acute iritis, there were 3 positive and 1 partial result; and that, as in the preceding table, a portion of the cataract cases show a syphilitic background. Some of these cases are so instructive as to warrant attention at length.

A man aged 59 gave a positive result. He was suffering from acute left iritis, and there was no perception of light in the affected eye. He said that he had suffered from chancre twenty years before; and that he had nine children, and his wife had experienced two miscarriages; six of the children had died in infancy; three children were still living.

Another man, aged 73, gave a positive result. His vision was defective, due partially to cataract, but he had throughout the fundus those white choroidal spots, somewhat analogous in appearance to Tay's choroiditis. The family history was good.

A man, aged 25, came to the hospital for defective vision—6/24 right, 6/60 left. Both eyes were filled with vitreous opacities, apparently due to hæmorrhage. The fundus was studded with hæmorrhages. The father and mother were alive, in good health, aged 50 and 53 respectively. He has three brothers and two sisters alive, and in good health; five died in infancy. Ultimately the fundus became more visible; white masses were seen over the right fundus; in the left there was detachment of the retina. No history of personal syphilis could be obtained.

A girl, aged 15, gave a positive reaction. She was suffering from interstitial keratitis. Two sisters living also suffered from bad eyes. Three or four children died in infancy. Her mother gave a positive reaction also.

A girl, aged 24, was brought to the hospital by reason of error of refraction. She was suffering from epileptic seizures, and had a chronic conjunctivitis. The reaction was positive.

A boy, aged 9, was sent by the school authorities to have his eye examined. The vision was good—there was simply an error of refraction + 1.5 in each eye. There are five brothers and sisters living; one child is said to have a weak heart, and another has had infantile paralysis. Another brother died at 5 years of age after operation for post-nasal growth, and the mother has had four miscarriages.

PLATE 6.

IN-PATIENT CASES EXAMINED AT THE VICTORIAN EYE AND EAR HOSPITAL
FROM 1ST FEBRUARY TO 31ST MAY, 1911.

RESULTS.

Diseases.							Negative.	Positive.	Partial.
Trachoma	...	...	...	...	...	...	3	1	1
Scleritis	...	...	...	...	...	...	1	...	...
Iritis	Acute	...	...	...	...	...	2	2	...
	Old	...	...	...	...	...	...	1	...
Sympathetic ophthalmitis	...	...	...	...	...	...	1	...	...
Corneal ulcer	...	...	...	...	...	...	1	...	1
Cataract	...	...	...	...	...	...	15	2	1
Glaucoma	...	...	...	...	...	...	1	...	1
Obstruction retinal artery	...	...	...	...	...	...	1	...	...
Optic atrophy	...	...	...	...	...	...	...	1	...
„ neuritis	...	...	...	...	...	...	2	...	1
Strabismus	...	...	...	...	...	...	1	...	...
Injuries	...	...	...	...	...	...	11	1	...
Miscellaneous	...	...	...	...	...	...	1	...	...
							40	8	5

Total—53 cases, of which 8 gave a positive and 5 a partial reaction.

A child was seen, at the age of 4, suffering from what appeared to be pseudo-glioma and iritis. Four years subsequently she returned to the hospital, and was found to give a positive reaction.

As showing that a negative Wassermann result may be associated with undoubted syphilis, the following case may be cited:—A boy, aged 11, was brought to the hospital suffering from interstitial keratitis. The result was negative. An examination of the mother also gave a negative result. There are five children living and four dead; and, in addition, there have been two miscarriages.

A child, aged $4\frac{3}{4}$, was brought to the hospital suffering from congenital cataract. When on the operating-table, about to be needled, a trace of an old adhesion was seen in the right eye. The operation was deferred, a Wassermann determination made, and a positive result obtained.

A man, aged 32, came to the hospital suffering from a cut in the supra-orbital region. The cut, instead of healing, became indurated. A Wassermann determination showed a positive reaction.

A woman of 70 had a cataract removed by the combined operation. Apparently inexplicable iritis set in. A positive reaction was given by the Wassermann determination.

A man, aged 25, came to the hospital because some chaff had been blown into the conjunctival sac, and caused irritation. Persistent conjunctivitis set up, which lasted seven weeks, resulting in a Wassermann determination being made. The result was positive.

A man, aged 31, was admitted to the hospital suffering from optic atrophy. Two Wassermann determinations were made, one giving a positive and the other a negative result.

A man, aged 63, was needled for secondary cataract. Iritis ensued. A Wassermann determination was made, and gave a positive result.

Two girls, aged 16 and 12 respectively, were admitted to the hospital suffering from trachoma. The older gave a negative and the younger a partially positive result.

A patient, aged 35, was admitted, suffering from optic neuritis, vitreous opacities, and evidence of old iritis. He had been on anti-specific treatment. The result of the determination was partial. There was a direct history of syphilis. The reaction was again taken, and was positive. An injection of salvarsan was given, and a week later the test was again applied, with a partial result. It only remains to summarise the results, and these are produced in Plate 7.

PLATE 7.

The following table includes some cases rejected for various reasons from the foregoing tables, and gives a summary of the hospital results.

EYE CASES.

(Mondays and Thursdays.)

	Positive.	Partial.	Total number of cases.
1. Prior to 1st February, 1911 (eight months) ...	52	10	121
2. From 1st February to 31st May, 1911 (four months) ...	37	27	443
3. <i>Total, twelve months</i>	89	37	564

EAR CASES.

(Tuesdays and Fridays.)

	Positive.	Partial.	Total number of cases.
1. Before 1st February, 1911 (eight months) ...	10	1	38
2. From 1st February to 31st May, 1911 (four months) ...	9	8	107
3. <i>Total, twelve months</i>	19	9	145

This plate is exceedingly instructive. It will be noticed that during the eight months ending 31st January, 52 positive and 10 partially positive results were obtained, but during the four months ending 31st May, 1911, when all cases were examined, 37 positive and 27 partials were obtained. If (as there seems undoubted evidence) partial cases represent syphilis in some degree of attenuation, it is clear that such cases were missed in considerable numbers when only doubtful cases were reported. For the eight months the results should have been 74 instead of 52 positives, and 54 instead of 10 partials, inasmuch as the total number of cases treated at the hospital during those periods was very much the same. It is, therefore, evident that, with the staff on the alert to observe every evidence of syphilis, with every convenience for its determination, that many cases were missed which were detected by the comprehensive examination made in the latter four months. In other words, that in the clinic of alleged syphilophobes, the extent had been under and not over estimated.

Earlier in the day I referred to the internal evidence of the accuracy of the work, and that is shown by the fact that, when all cases were examined during the last four months of the period on Mondays and Thursdays, 13 per cent. proved to be syphilitic, and on Tuesdays and Fridays, 15 per cent. This also clearly indicates that the operations of the syphilitic poison are general. Very few of the ear, throat, and nose cases would have been regarded as syphilitic by reason of the disease for which they came, and syphilis must, therefore, be regarded as rather providing a convenient background for the operations of infections, than of being directly productive of special mischief.

The result of the investigation, showing that, out of a hospital population of 550 people, at least 13 per cent. are syphilitic, is far-reaching to a degree. This hospital population is superior to most hospital populations; the patients mostly walk to the hospital; the majority come for minor ailments which have nothing to do with syphilis, and it certainly suggests that the percentage of syphilis in the general population of the city may be very large.

PLATE 8.

ALL EYE CASES ADMITTED TO THE VICTORIAN EYE AND EAR HOSPITAL
FROM 1ST FEBRUARY TO 31ST MAY, 1911.

RESULTS.

Total Cases.	Positive.	Partial.	Total.
443	35 (8 per cent.)	23 (5·2 per cent.)	13·2 per cent.

ALL EAR, NOSE, AND THROAT CASES ADMITTED DURING THE SAME
PERIOD.

107 | 9 (8·5 per cent.) | 8 (7·5 per cent.) | 15 per cent.

SUMMARY.

550	44 (8 per cent.)	31 (5·6 per cent.)	13·6 per cent.
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So far as I am aware, there are no published communications relating to the significance of these partial Wassermann determinations, but in a considerable number of them we have direct evidence that the subjects are syphilitic, and it is probable that they simply represent a form of attenuation. For public purposes, it is generally assumed that six positive Wassermann determinations mean ten cases of syphilis. This can, of course, only be an approximation, and a result which can only be reached by taking an average of all kinds of cases. But it is significant that the positive results bear to the partial results a proportion of about six to four.

The general effect of the investigation is to fully confirm the value of the oculist's predilection for mercury, and it on the whole confirms the clinical findings, simply emphasising the fact that many cases of syphilis are missed on the clinical findings alone.

A large pathological question arises out of these remarkable results. We know, of course, that syphilitics who die, and have presented no clinical sign whatever of syphilis, frequently do show disease of the arteries, and certain thickening of interstitial tissues. It may be possible, however, that the constitutional resistance of a syphilitic may be lowered, and yet there may be no macroscopic evidence of syphilis whatsoever. That position seems exceedingly probable, but an exact determination on the point would be a matter for future investigation.

In other sections of this Congress, reference will be made to the larger aspect of the syphilitic problem. In this section, it will perhaps be sufficient to point out that the extirpation of this disease would reduce enormously the amount of grave eye diseases; that it would render eye operations less frequent, and more certain in their results; and that it would vastly increase the efficiency of the community.

There remains still the large question which looms in mind, and which still assumes but the form of a provisional hypothesis, namely, that with the extirpation of syphilis, it is quite likely that very few deaths would occur until old age was reached, apart from those mechanical accidents or accidents of disease which occasionally destroy the finest constitution.

The result of our year's work have now been placed before you. It is evident that, in the course of such a presidential address, it is impossible, even if it were expedient, to attempt a still more detailed analysis. The method, however, is simple, and the outline clear, and it is for those of us who are interested, to work out the problem in its relation to special ophthalmic diseases.

Arthur Foerster gives, in the *Lancet* of 24th June, 1911, the following statistics of the positive results obtained. It is, perhaps, the latest table which has been published, and shows clearly the different degrees in which the Wassermann reaction may be expected to give positive results:—

Disease.					Lesser (Berlin).	Merz (Basle).	Jesionek and Meirowsky (Cologne).
					Per cent.	Per cent.	Per cent.
Primary syphilis	...	...	...	...	69	71	66·6
Secondary syphilis	...	...	...	...	91	97	96·7
"	"	latent	...	...	67	33	50·3
Tertiary	"	...	...	...	90	80	87·5
"	"	latent	...	...	46	30	46·4
Tabes	...	...	...	...	56	(?)	52·6
General paralysis	...	...	...	...	100	(?)	85·7
Hereditary syphilis	...	...	...	...	(?)	81	88·8
Non-syphilitic cases	...	...	...	...	(?)	nil.	0·8

DEMONSTRATION ON THE DISSECTION OF THE OX EYE-BALL, WITH SPECIAL RELATION TO SMITH'S OPERATION FOR CATARACT.

By PROFESSOR ANDERSON STUART.

THIS demonstration was well attended and much appreciated by the section. Each man was provided with a couple of ox eye-balls, dishes for water, &c., stains, forceps, scissors, tenotomy hook, glass tube, &c. Following Professor Stuart's directions, the eye-ball was opened by cutting round the sclerotic with scissors, and the vitreous, with lens and suspensory ligament attached, shelled out.

The canal of Petit was then demonstrated by puncturing the suspensory ligament, inserting the pointed end of a glass tube and blowing in air, which assumed the form of a ring of bubbles around the lens. The suspensory ligament was then broken through for about two-thirds of the way round and the lens separated from the vitreous.

The back part of the vitreous is then held firmly in the left hand and squeezed, making tense the anterior portion—the *fossa patellaris*. This tense vitreous was found to stand considerable pressure with the end of a tenotomy hook—with more pressure it was punctured, and through the hole made a bead of vitreous was seen to project.

The edge of this puncture could be lifted up on the hook—thus demonstrating the anterior hyaloid membrane.

At the conclusion, Professor Stuart was thanked heartily for his instructive and interesting demonstration.

THE IMPORTANCE OF LUMBAR PUNCTURE IN THE PLUMBIC OCULAR NEURITIS OF CHILDREN.

By J. LOCKHART GIBSON, M.D. (Edin.), M.R.C.S. (Eng.).

ANXIOUS to read this note because lumbar puncture, which was only mentioned in 1905* and 1908† as of importance in particularly severe cases, has proved, by further experience, to be of great importance in some cases whose symptoms were merely squint and optic neuritis. I have, therefore, to urge lumbar puncture as routine treatment in all cases of ocular neuritis due to lead, even if the diagnosis be only provisional.

Further, lumbar puncture has proved in my hands so apparently important and beneficial as to suggest its usefulness as immediate routine treatment in cases of optic neuritis or choked disc or papilloedema not induced by lead, either as the only operative treatment, or to gain time and knowledge prior to a decompression trephining. The importance of lumbar puncture in plumbic ocular neuritis emphasises the importance of early diagnosis in these cases, for given an early diagnosis, good sight as a result of treatment is almost assured. It cannot be too much again insisted on that the diagnosis of plumbism in some of these cases of ocular neuritis in children, has so little to indicate it, that parallelism with the cases which I have been able to prove as due to lead is often the main reason for a diagnosis.

In my own experience the cases which run most risk of being confused with plumbic ocular neuritis in children, are cases of gummatous meningitis. The possibility of an intra-cranial tumour other than a gummatous one, has, of course, to be borne in mind.

I shall endeavour to show that lumbar puncture in a case of plumbic ocular neuritis, which has been removed from further opportunity of ingesting lead and placed in bed, discovers increased tension of intra-spinal fluid on the first puncture; very little increased tension on repuncturing two days later, and no increase on subsequent punctures. A continuation of increased tension, therefore, at a third puncture, should make us suspicious that the case might be other than lead, and the increased tension due to an intra-cranial cause of a more persistent nature, such as tumour.

If a Queensland child below the age of 8 years, with a history of recent convergent squint, found on examination to be due to paralysis or paresis of one or both external recti, is brought to one's consulting-room, the provisional diagnosis even prior to examination of the fundi is lead, and optic neuritis or choked disc will be found. And this, although the only symptom noted by the parents is, in these cases, the most valuable and fortunately noticeable one of squint.

A brief account of a few cases at the end of this paper will make it graphic, and enable it to be short. The somewhat comprehensive definition published in former papers may be restated:—"The disease is characterised by the sudden onset, with or without preliminary colic, vomiting, and constipation, and with or without severe headache, rigidity of the neck, or retracted head and acute pains at the back of the neck, by paralysis or paresis of one or both external recti, accompanied by optic neuritis or choked disc, and unaccompanied by rise of temperature or by albuminuria; accompanied also by the well-known blue line on the gums

* Aust. Med. Congress Transactions, 1905.

† B.M.J., 1908.

(produced by deposit of the black sulphide of lead); by the finding of small but distinct quantities of lead in the urine; by the fact that the patient has had access to painted surfaces which have either been recently painted, or more often whose paint has become powdery and easily detachable—this powder being the very soluble carbonate of lead; accompanied further by the fact that the patient bites his or her nails—the exceptions suck their fingers.”

However, paralytic squint, choked discs or disc, available lead paint on verandah or garden railings which has become powdery from exposure, or much more rarely fresh paint, in addition to the habit of biting the nails or sucking the fingers, may be the only evidence positive for plumbism we may be able to get. That is short of urine analysis, which is slow and difficult, and requires an expert chemist, and also reagents and utensils which have themselves been proved to be free from lead. Blue lines in the gums are not infrequently absent.

One directs with much less hesitation that a lumbar puncture be done in a case of a child in a hospital than one advises it in the case of a private patient of one's own, or sent to one by another medical man. It is, however, treatment which should be considered urgent.

A case sent to me by Dr. Kerr Scott, of Brisbane, and quoted later, brought this home to me more forcibly than my hospital cases.

The nearly constant existence of increased intra-spinal, and, therefore, of intra-cranial tension, in cases without headache or other symptoms than optic neuritis and paralytic squint, suggest that although it seems impossible to retreat entirely from a diagnosis of peripheral neuritis being a chief result of plumbism, still there is an element also of lead encephalitis in even early cases.

I have, indeed, suggested, and do suggest, that in lead cases exhibiting no head or eye symptoms, but only limb paralysis, such as wrist and foot-drop, a lumbar puncture should be done at once, in the hope of relieving pressure on the spinal nerves in the spinal canal.

It will be readily agreed to that increased intra-cranial and intra-spinal tension may be expected to have some harmful influence on the nerve trunks which pass through the cranial and spinal foramina, and that many of the conditions observed could be attributed to this. There is, in fact, some, though not yet conclusive evidence, that increased tension will be found in ordinary lead cases.

Out of nine cases of plumbic ocular neuritis treated by me during the last twelve months, I shall give short accounts of three. All but one of the nine recovered good sight. The reason why he did not recover better sight will be evident from the account of the case.

A.W., male, aged $5\frac{1}{2}$ years; sent to me by Dr. Scott on 30th January, 1911. Dr. Scott had seen him the day before. Three days previously his parents had noticed a squint. He had suffered from retching in the early morning for a week and from some headache. He had also been constipated. Otherwise he appeared to be in good health.

I found paralysis or extreme paresis of each external rectus, intense optic neuritis or choked disc in each eye, seven diopters of advancement or swelling of the right disc, and five diopters of swelling of the left disc. His nails were only slightly bitten. There were some blue lines on his gums. Paint on the verandah railings of his dwelling is white lead in a

very powdery state, coming off readily on the hands. Diagnosis—plumbic ocular neuritis. Prognosis good regarding life; guarded to hopeful regarding sight.

I advised immediate lumbar puncture, salines, and dilute sulphuric acid; pilocarpin hypodermically; iodide after a few days. That afternoon, Dr. Scott did a lumbar puncture, and withdrew 16 drachms of clear fluid, which came out under greatly increased pressure. The needle was withdrawn when the fluid began to drop slowly.

Two days later, Dr. Scott again lumbar punctured and removed only 40 minims, *i.e.*, there was practically no increased tension; the fluid only dropped out.

On 6th February, *i.e.*, seven days after his first visit to me, his external recti were recovering, and the swelling of his discs was less.

A month later the boy was very well himself, but there was still some paresis of his right external rectus and still some two to three diopters of swelling in his discs.

A month later his squint had disappeared.

I examined his eyes four months after his first visit to me. I found no squint and no swelling of his discs. The outer edges of discs were a little irregular. Sight said to be, and apparently is, quite good. Health excellent.

E.P., male, aged 5 years. Admitted to Hospital for Sick Children in July, 1911. Complaining on and off for a fortnight of pain in the back of his head and vomiting. His dwelling had not been painted for a long time, and the paint rubs off on the hands.

Nails bitten. Blue lines on his gums. Not complaining of headache on admission. Sees pretty well. Very slight squint due to slight paresis of each external rectus. Right disc advanced four diopters. Exudation thick. Veins of fundus very distended. Some hæmorrhages.

Left disc advanced five diopters, thick solid-looking exudation.

Lumbar puncture done that day, eight (8) drachms of clear fluid removed under greatly increased pressure.

Two days later lumbar puncture repeated, and $4\frac{3}{4}$ drachms of clear fluid drawn off.

Four days after first lumbar puncture there was only one diopter of swelling in each disc, and paresis of external recti was slighter.

A month later paresis had quite cleared up and the swelling in discs had quite disappeared.

Now, two months after admission the discs have a good outline, and it would be difficult to say that they had ever been in a state of neuritis. Sight apparently perfect.

This case is included because there was so little to call the parents' attention to the serious state the child was in, and also because, though very acute, as evidenced by continued increase in tension at the second lumbar puncture, and by the state of his discs, it was an early case, and evidently one where immediate lumbar puncture was urgently needed.

Q.McG., aged 4 years. Admitted 10th July, 1910, to Hospital for Sick Children. History of whooping-cough and rheumatism all the winter. For about six weeks has been always tired. Saw quite well, and eyes straight, until a month ago, when the eyes turned. Two weeks ago said everything was dark, and he ceased to care to run about. Was well, but weak.

On admission right external and internal recti paralysed. Left external and internal recti paresed. Some five diopters of swelling in discs.

Small hæmorrhages in each disc. Left pupil reacts very sluggishly. Very little sight, practically only perception of light.

Bites his nails. Powdery paint available.

Prognosis regarding life good; regarding sight guarded to unhopeful.

Lumbar puncture day of admission, 7 drachms of clear cerebro-spinal fluid removed under considerable pressure. Two days later $7\frac{1}{2}$ drachms removed also under pressure. Three days after admission sees large objects and recognises them, but cannot recognise a penny-piece. Four days after admission a third lumbar puncture disclosed no increased tension of cerebro-spinal fluid. Ten days after admission counted fingers. Sight much improved.

Seventeen days after admission paralysis nearly gone, only left external rectus still slightly paresed. Sight much improved, especially with right eye, and can with it recognise a small pin at 20 inches.

A month after admission swelling of both discs has practically disappeared. Each disc is large and pale and outline is irregular. Boy very well himself, and said to see well; but sight had certainly suffered. He now, a year after, sees—right eye $\frac{6}{36}$, left eye fingers at 5 yards. Goes to school and learns; but sight is recognised to be defective.

It will be noticed, and this case has been consequently included, that the symptoms had continued for some weeks before he was removed from his home, and before he was treated; and that he had seen badly for two weeks before admission. It will be further noted that on the second lumbar puncture the intra-spinal tension was as great as on the first puncture.

The treatment, therefore, is removal from their homes, lumbar puncture, salines, and dilute sulphuric acid for a few days, and then iodide of potash, also pilocarpin hypodermically, but this last is less necessary if lumbar puncture be employed.

The use of lead paint within the reach of children should be prohibited by law.

DISCUSSION.

Dr. DOUGLAS MACDONALD said he had a case of choked disc with right external paresis in a woman of 25 years, and asked whether it might be a case of plumbic optic neuritis. All other conditions were excluded, and a Wassermann examination was negative.

Dr. MARION THORNETT asked whether Dr. Gibson attributes the very rapid cure of the optic neuritis to the lumbar puncture, or to the lumbar puncture with salines; also whether he thinks salines alone would bring down the intra-spinal and cranial tension.

Dr. E. A. D'OMBRAIN related a case of a girl of 5 years with wrist-drop, blue line, and typical symptoms of plumbism, and failure of vision. The child removed from home and treated, and the vision recovered, and finally the paralysis. He felt certain, in view of Dr. Gibson's results, that this case would have shown choked disc had they looked for it.

Dr. A. WALLACE WEIHEN asked if, since the appearance of Dr. Gibson's original papers on the subject, any statistics of similar cases had been collected from other parts of Australia. One would have expected this,

as the surroundings of developing children in wooden houses, verandahs covered with lead paint, hot climate, &c., were exactly the same in other places, *e.g.*, in Western Australia.

Dr. J. C. HALLIDAY said that, at the Royal Prince Alfred Hospital during the last few years, Dr. Warren and he were much interested in about six cases of optic neuritis in children, with no pathological condition that the physicians could discover. They were usually hypermetropic, and with correction see fairly well. Some have been watched for years and have improved, others have remained the same. They saw no evidence of plumbism.

The PRESIDENT said that he had not seen any cases of plumbic optic neuritis in children, but many in adults.

Dr. R. H. JONES also spoke; and Dr. LOCKHART GIBSON replied.

On Thursday afternoon Dr. J. C. Halliday performed, before about twenty members of the section, at the Royal Prince Alfred Hospital, four cataract operations by the intra-capsular or Smith's method.

CATARACT EXTRACTION WITH LATE BUTTON-HOLE IRIDECTOMY.

By NORMAN E. GIBBS, F.R.C.S. (Edin.), Melbourne, and A. WALLACE
WEIHEN, M.A., M.D., Sydney.

The Operation of Extraction with late Button-hole Iridectomy.

AMONG the various methods of cataract extraction now followed, we feel it worth while to draw attention to the advantages gained, and the minimum of risk run, in the performance of this operation as a routine one, in all uncomplicated cases of lens extraction. It is not our purpose to dwell upon the various modifications in this operation (cataract extraction) up to the present time, but it is interesting in this connection to quote from Grimsdale and Brewerton's "Ophthalmic Operations," p. 234 :—"The original method of cataract extraction did not include iridectomy; this was an addition of the nineteenth century, due largely to Von Græfe—before this time the chief causes of failure were sloughing of the cornea and inflammation or prolapse of the iris. He noted that the inflammation almost always began at the part of the iris opposite the centre of the wound, and suggested that, if this part were removed, the inflammation could not occur. Mooren (a pupil of Von Græfe) was the first to carry this suggestion into effect. Since then, surgeons have been divided into upholders of the simple or of the combined operations."

Both methods have their advantages, and both their disadvantages.

The simple extraction leaves the eye practically normal in appearance, with a round active pupil, able to perform all its functions both in relation to light and convergence. This reaction to light is of much greater importance, here, in Australia with its bright light, than in the Old Country where the presence of a wide coloboma is less apt to cause disturbance from dazzling.

The presence of the intact iris is, however, of far greater importance, in that it prevents that most common disaster in the combined operation—the presence of capsule incarcerated in the wound.

Another, and not unimportant gain, is the lower degree of astigmatism finally resulting with this operation. Now, all these advantages are equally present with the operation under consideration (the extraction with late button-hole iridectomy).

Unfortunately, the risks entailed in the simple extraction operation are greater, and these must be here mentioned, that their avoidance may be discussed and considered in the late button-hole iridectomy operation.

The chief disadvantages then are :—

1. In the delivery of the lens, greater pressure is required to force it through the narrow pupil.
2. Lens remnants are more apt to be left behind.
3. The risk run of prolapse of the iris during the days immediately following the operation.

Now, as to the more usually performed combined operation : Here all the above-named difficulties are less likely to occur, yet there is a danger, far more difficult to guard against and avoid, and one graver to the ultimate result, visually, to the eye, in the possibility of capsule becoming entangled in the wound.

This complication is just as likely to follow an operation where everything has gone off smoothly, as when the lens has been reluctant in presenting, the patient unsteady, or some other difficulty has faced the operator—and it is quite a common thing to see an operator making blind attempts at the end of an operation to repose invisible capsule. This incarcerated capsule, of varying amount and density, later becoming vascularised and tough, is probably the commonest cause of failure in this operation at the present time.

Now it is just this disaster that is entirely avoided in the late button-hole operation as also in the simple extraction.

Putting the case another way—

The steps of the combined operation are—

- | | |
|----------------|-----------------------|
| 1. Section. | 3. Capsulotomy. |
| 2. Iridectomy. | 4. Expulsion of lens. |

The steps of the button-hole extraction are—

- | | |
|-----------------|-----------------------|
| 1. Section. | 3. Expulsion of lens. |
| 2. Capsulotomy. | 4. Iridectomy. |

So that, in the former the iridectomy is done early in the operation, and in the latter, at the very end.

Thus, by the reposition of the iris after the delivery of the lens, any capsule entangled in the lips of an operation wound is broken away or replaced in a safe position. From a letter received from a most carefully trained and accurate observer, who was recently working in Fuchs' clinic in Vienna, the following quotation from a discussion of methods in common use there is of interest :—"There is a strong tendency to simple extraction with iridectomy at the end, if it appears necessary."

Broadly then, we may narrow down the comparison between these two methods by saying, that the great risk in simple extraction is prolapse of iris, which is easy to see, and, in the combined operation, the great danger is incarceration of capsule, which is almost impossible to detect at the time of the operation.

Let us now take up the consideration of the late button-hole operation. It admittedly possesses practically all the advantages of the simple extraction, and our aim is here to show that the difficulties attaching thereto can be reduced to a minimum.

Taking these difficulties *seriatim*—

First.—The greater pressure required to deliver the lens. This can be met by instilling homatropine one hour before operation, so gaining a large pupil. This has the further advantage that any soft cortex is less likely to be scraped off, when the lens is delivered through a wide pupillary opening. True, there is more difficulty in making the section, but this is not great, and as the lens capsule has to be opened later no risk is involved.

It is always possible, if any difficulty arise (such as a lens reluctant in presenting, or the presence of much soft matter tucked up behind the iris) to fall back upon an iridectomy, as of old. By following such a routine, every case would be given the chance of getting the benefits of the late iridectomy.

Second.—If much soft matter be left behind after delivery of the lens. This point is already partly discussed. It was Mr. Stanford Morton's custom at Moorfields to follow the sweep by which the lens is expressed with a second stroking movement (like one wave following another), and thus, whilst the iris is prolapsed into the wound, to carry away the bulk of any remaining soft matter in front of the instrument used.

If, after reposition of the iris, soft matter is still seen, it may often be withdrawn by a Daviel's scoop, piece by piece, the scoop being introduced into the eye.

Third, and by far the most important difficulty, the risk of prolapse of the iris.

This is the chief point under consideration in this paper.

The wound, after extraction, rarely closes without an occasional escape of aqueous, and this is often sufficient to be noticed by the patient and described as a "gush of tears," or in some such terms. It is at such a time that the iris is in grave danger of being carried into the wound; the presence of the peripheral button-hole in the iris is intended to prevent this occurring. The aqueous can now escape in a direct course from the posterior to the anterior chamber, and, in a number of cases, where a leaking chamber has continued for one to three days, we have noticed no tendency to prolapse. It is well to emphasise the fact that the button-hole must be peripheral.

The steps of this button-hole iridectomy extraction are just the same then as in simple extraction with the addition that *after* the reposition of the iris a small peripheral button-hole or window is made in the iris opposite the centre of the wound. With this, as in every other eye operation, attention to detail is the royal road to success, and so several smaller points are here worthy of note—

- (a) In making the section it is of decided advantage to leave a good broad conjunctival flap.
- (b) In deciding to do a button-hole iridectomy, or the ordinary iridectomy, one must be guided by several points—
 1. *If* on returning the iris the pupil remains circular and central it may be safely undertaken.

2. *If* the iris appears to bulge and come forward to the wound the conjunctival flap may be put in position and the patient allowed to rotate the eye by following the movements of the hand in an upward and downward direction. If the iris does not appear displaced by this rotation of the eye a button-hole may be decided upon. In a series of cases done by Fuchs, he, in many instances, found that after the hole in the iris had been made all tendency for the iris to bulge forward disappeared, and he confidently left these cases with the sphincter intact. These, however, are minor points which soon come with experience of the operation.

After Treatment.

It is *well* to begin atropine early in these cases, for there is always some traumatic iritis following the stretching of the iris tissue and the cutting and manipulation involved. It has been our experience in the series of cases submitted that there is a tendency for an inflamed iris to form posterior synechiæ to the lacerated capsule remaining. This, however, has no ill result upon the ultimate vision in the eye. Certainly we would in no case recommend the early use of eserine. Otherwise the after treatment is the same as with other extractions—the patient usually leaving the hospital at the end of a fortnight.

Contra-indications

are much the same as those stated in the text-books, and in the writers' experience certainly—(1) the friable washed-out iris of the diabetic patient is unfavourable, and to a less degree are (2) those cases of complicated cataract where already many posterior synechiæ exist.

In conclusion, the cardinal considerations in favour of this operation are—

- (1) The great certainty that, with the reposition of the iris, the presence of any capsule up to the wound has been effectually disposed of, and along with it, the possibility of that chronic, intractable condition associated with capsule incarcerated in the scar.
- (2) The gain to the patient, both functionally and from a cosmetic standpoint, where the sphincter pupillæ is intact.

In a series of cases done by one of us at the Royal Westminster Ophthalmic Hospital, the results were uniformly satisfactory, although prolapse of iris occurred in one exceedingly bad patient on the day after operation. This prolapse was excised, under cocaine, in the ward, and the case went on uneventfully and ended quite well.

Our latest case, done in August of this year, was an hypermature cataract with a dense amber nucleus, and the visual result, six weeks after operation, was 6/9 with—

$$\begin{array}{r} +9.5 \\ +2 \text{ ax, } 170^{\circ} \text{ down and out,} \end{array}$$

without needling of lens capsule, which is present.

FINAL BUTTON-HOLE

SERIES OF CASES, MOOR-

No.	Name.	Age.	Stay in Hospital.	General Condition.	Special Condition.	Date of Operation.	Remark on Operation.
1	Charles W.	55	days. 14	Pyorrh. alveolaris, imtemperate.	Mature cataracts, R. & L.	16 Oct., 1909 R.	.....
2	James B. ...	73	14	Pyorrh. alveolaris..	Mature cateract, R. ... Immature „ L.V. = $\frac{6}{18}$	19 Feb., 1910 R.	.....
3	Henry B. ...	63	14	.....	Mature cataract, R. ... Immature „ L.V. = $\frac{6}{18}$	11 June, 1910 R.	.....
4	Robert T. ...	67	15	.....	L. Mature cataract ... R. Immature „	7 May, 1909 L.	Iris not satisfactorily reposed.
5	Sarah P. ...	78	14	.....	L. Mature... R. Immature.	10 Aug., 1909 L.	.....
6	John W. ...	69	14	Severe œzena, C. specific nasal caries.	R. Mature V = H.M. ... L. Hypermature V = P.L.	27 May, 1909 L.	.....
7	Thos. T. ...	50	14	Pyorrh. alveolaris	R. Nuclear cataract ... L. V = $\frac{6}{60}$	22 June, 1909 R.	Atropn. 8 hrs. after operation.
8	Wm. C. ...	70	13	.....	R. Aphakic dense capsule Vc + 10 = $\frac{2}{60}$ L. Swollen milky lens Shallow A.C. V = H.M.	31 July, 1909 L.	.....
9	George C. ...	69	26	.....	R. Nearly mature V = $\frac{1}{60}$ L. Early operation V = $\frac{6}{36}$	18 Sept....	.....
10	Martha C. ...	64	39	.....	L. Mature milky cataract	31 Dec. ...	.....
From this case onwards the statistics are better, because the operations are all done by one man.							
11	Wm. H. ...	67	14	.....	R. Aphakic ... Vc correction = $\frac{6}{6}$ L. Mature C.	29 April, 1909 L.	.....
12	Susan R. ...	66	16	Pyorrh. alveolaris	L. Swollen mature C. ... R. Immature V = $\frac{6}{18}$	29 April, 1909 L.	.....

IRIDECTOMY EXTRACTION.

FIELDS HOSPITAL, 1909-1910.

Late Complication.	Vision, &c., on Discharge.	Further Operation.	Ultimate Result.
.....	$\bar{c} \ 11 \ sp = \frac{6}{24} \dots \dots \dots$ $+4cy$	R. Needling, 4 Dec., 1909	$\bar{c} + 11 \ sp \ \bigcirc + 2 \ cy \ 10^*$ out = $\frac{6}{9}$ and J. r adde + 3.5
.....	No K.p. Iris updrawn at outer end of wd. $V\bar{c} + 10\bar{c} + 5 \ cy = \frac{6}{9} \text{ Ptly.}$	(Unable to follow case further; probably late needling and lower astigmatism.)	
.....	Iris discoloured—lateral post. Synechia. Pupil central. $V\bar{c} + 9\bar{c} + 3 \ cy \ H = \frac{6}{12}$	do	do
Abscission of prolapsed iris.	Outer pillar forward ... $V\bar{c} + 8 = \frac{6}{60}$	do	do
.....	No K.p. Fine capsule ... $V\bar{c} + 10 = \frac{6}{60}$	L. Needling (six weeks later).	$V\bar{c} + 12\bar{c} + 1 \ Cy \ H = \frac{6}{18}$ Habitudo mentis. 18
Some iritis ...	L. Slight injection, pupil small. Many post synechiæ. $V\bar{c} + 12 = \frac{6}{36}$	30 July, 1909. L. Needling	$\bar{c} + 12\bar{c} + 1.5 \ Cy = \frac{6}{9}$ add 3.5 and J. r.
.....	P. wide. No synechiæ ... $V\bar{c} + 10\bar{c} + 2.5 = \frac{6}{12}$	R. Needling (seven weeks later).	$V\bar{c} + 11\bar{c} + 3 = \frac{6}{9}$
.....	P. circular, eye quiet. } Some soft matter and capsule. No K.p. $V\bar{c} + 11 = \frac{6}{36}$	(Unable to follow case further.)	
Six days later aqueous turbid.	Injection subsiding. Iris bright. No K.p. P. will not dilate. T. full n.	17 Nov. R. Needling two days later T + 1.	Quiet P. $\frac{1}{3}$
Twelve days after opn. T + 2.	$V\bar{c} + 10 =$ Fingers.		Tn $V\bar{c} + 10 = \frac{4}{60}$
Spasmodic entropion twenty-seven days after opn. Some blood. in A.C. No cause stated.	Eye white. No K.p. } P. wide. $V\bar{c} + 10 = \frac{6}{24}$	.....	.....
Some conjunctivitis followed.	Eye quiet ... $V\bar{c} + 10\bar{c} + 1 \ Cy = \frac{6}{18}$	11 Sept. Needling L. ...	$V\bar{c} + 10\bar{c} + 1 = \frac{6}{6}$ and J. r.
.....	No K.p. Some soft matter ... $V\bar{c} + 9 = \frac{6}{36}$	17 June. Needling L. ...	$V\bar{c} + 9\bar{c} + 1.5 = \frac{6}{9}$

FINAL BUTTON-HOLE

SERIES OF CASES, MOOR-

No.	Name.	Age.	Stay in Hospital.	General Condition.	Special Condition.	Date of Operation.	Remark on Operation.
13	Benjamin S.	70	14	.....	R. Mature C. V=P.L. ... L. Almost M.C. V=H.M.	10 May, 1909 R.	.....
14	Do ...	"	"	.....	R. Aphakic V= $\frac{6}{9}$... L. As above.	5 July, 1909 L.	.....
15	Caroline C.	69	14	Pyorrh. alv. ...	R. Immature V=Fingers at 1 metre. L. Sclerosed lens V=P.L.	17 May, 1909 L.	.....
16	Chas. D.	80	21	.....	R. Old injury no P.L. ... L. Calcareous Anc. polar opacity V= $\frac{6}{36}$ il.	27 May, 1909 L.	.....
17	Amy W. ...	61	14	.....	R. Swollen mature C. V=P.L. L. Early opacities V= $\frac{6}{24}$	15 July, 1909 R.	.....
18	Pricilla C. ...	62	14	Albumen ...	R. Mature H=H.M. ... L. Immature V= $\frac{6}{60}$	28 Oct., 1909 R.	.....
19	Mary C. ...	73	12	.....	R. Old injury, no P.L. ... L. Mature C. V=H.M.	6 Dec., 1909 L.	.....
20	Mary T. ...	60	14	.....	R. Advanced C. V=H.M. L. do	9 Dec., 1909 R.	.....
21	Susan M. ...	87	13	Articular rheu. ...	R. Mature V=H.M. ... L. Immature V= $\frac{4}{60}$	6 Dec., 1909 R.	.....

NOTE.

1. In all these cases the depth of the A.C. was fairly equal, excepting
2. The button-hole was small and peripheral, and in many cases could only be seen by careful focal illumination,
3. The astigmatism is practically lower than with the combined operation, though a larger number of cases condition estimated within six
4. The cosmetic result is quite as

IRIDECTOMY EXTRACTION—continued.

FIELDS HOSPITAL, 1909-1910.

Late Complication.	Vision, &c., on Discharge.	Further Operation.	Ultimate Result.
.....	R. No K.p. $P \frac{1}{3}$ Inner periphery of iris forward. $V\bar{c} + 10\bigcirc + 1.5 = \frac{6}{18}$	1 July, 1909. R. Needling	$V\bar{c} + 11.5 \text{ sp} = \frac{6}{9}$ and J. 2.
.....	L. Pupil dilating outwards. Post synechiæ and soft matter. $V\bar{c} + 10\bigcirc + 2 \text{ Cy} = \frac{6}{36}$	(Unable to follow case further.)	
.....	L. No K.p. Much soft matter ... V=Fingers.	1 July, 1909. L. Needling	$V\bar{c} + 14 + 1.5 \text{ Cy} = \frac{6}{12}$ and J. 2.
Two 7 days later some soft matter behind iris. A.C. slow to reform Pat. difficult.	Slight injection. No K.p. Soft matter and capsule. $V\bar{c} + 10 = \frac{6}{36}$ all.	(Unable to follow further.)	
Vomited twelve hours after operation.	No K.p. Some postr. synechiæ. Lens remnants. $V\bar{c} + 12 = \text{Fingers at 1 metre.}$	7 Oct. R. Needling ...	R. $V\bar{c} + 8 + 2.5 \text{ Cy} = \frac{6}{5}$ and J. 1.
.....	No K.p. P. moderately dilated ... $V\bar{c} + 13\bigcirc + 5.5 = \frac{6}{12}$	29 Nov. R. Needling ...	$V\bar{c} + 15 = + 1.75 \text{ Cy} = \frac{6}{5}$ and J. 1.
.....	No K.p. P. wide. P. synechiæ. Some soft matter. V=H.M.	(Unable to follow case further.)	
.....	No K.p. P. wide. Some soft matter. V=Fingers at 1 metre.	do	do
.....	R. Quiet. No K.p. P. wide. No synechiæ. $V\bar{c} + 13\bigcirc + 2 = \frac{6}{18}$ pty.	do	do

where special mention is made of iris being forward to scar.
and looking upwards for the arcus senilis hides it on raising upper lid and looking directly forward.
would have to be collected to speak positively upon this point. As a rule, these patients had their refractive weeks after the operation.
good as with a simple extraction.

SMITH'S OPERATION FOR CATARACT EXTRACTION IN THE CAPSULE.

By J. C. HALLIDAY, M.B., Ch.M. (Syd.), F.R.C.S. (Edin.), D.P.H. (Camb.).

THE subject of cataract, for obvious reasons, must always be of great interest to ophthalmic surgeons. I realised the great boon the orthodox operation for extraction was to many, who otherwise would be deprived of sight, but at the same time I was struck with its limitations, and with its failures, and frequent poor results. So, in quest of further light on the subject, I journeyed to Amritsur, in the north of India, and put myself under Lieut.-Colonel Smith's tuition for two months. Like all of us, I had heard of his intra-capsular operation, and of the favourable accounts published by pupils, and though expectant of learning much, I went with an open mind to form my conclusions at first hand. Colonel Smith's first lesson—the day I arrived—was to let me see a beginner operate. I forget now whether I saw Smith himself operate before I started—but his method of teaching is not talking much, but giving you the knife and fixations forceps, and telling you to go ahead.

I will not detain the section with a detail account of Smith's operation. It has been lucidly described with good diagrams in most of the leading ophthalmic journals, and I published a description of it in the *Australasian Medical Gazette* of July, this year. But there are one or two points I would like to touch upon. First the antiseptic douche of 1 in 2,000 perchloride. Most Indian surgeons agree with Smith in this—it never does any harm, and doubtless saves a great deal of suppuration.

The incision.—The most important point about this is that it should be large enough— $\frac{2}{5}$ of the cornea. Smith prefers the puncture and counter puncture to be almost scleral and the cut out above, well in the clear cornea—but the exact position of the incision does not materially affect the expulsion of the lens—provided, of course, that it is large enough. I admired Smith's bold, yet accurate, incision with the thrust of the knife, or at least with the backward draw.

The iridectomy.—In this the method is conservative, and the combined operation is deemed safer, and is usually done.

For the extraction the speculum is removed and the lids held by the assistant. About 75 per cent. of the cataracts are delivered with the upper edge first—that is erect—and 25 per cent. tumble, that is the lower edge first dislocates, that is become detached from the suspensory ligament, and rolls forwards and upwards on its upper suspensory attachment as a hinge.

Immature and hard lenses usually come out straight, and pressure straight backwards is used to bring this about—as soon as the lens gives, the pressure backwards is relaxed and a sweeping movement upwards is made by the hook, thus delivering the lens.

Morgagnian cataracts will tumble, and pressure is made with the hook downwards towards the feet, as the lens tumbles up the cornea is tucked gently beneath it by the hook, and the lens lies over and outside the cornea. If its upper attachment is still intact, the concavity of the

hook is drawn fairly firmly across the line of the incision and readily frees the lens. If it is touched with the end of the hook the capsule is liable to burst. In spite of all care the capsule will rupture in from 5 to 10 per cent. of cases. In which case the capsule, in part or whole, is picked out by the iris forceps. If the lens was a tumbler the capsule may be hanging outside the wound and is easily removed—but when the lens come out erect, the capsule is attached below and is much more difficult to extract.

The iris is replaced by separating it from the upper lip of the wound and allowing it to fall back upon the hyaloid.

Loss of vitreous.—Seeing and doing the cases in India one is at once struck with the great number in which there is no vitreous loss—at times the vitreous is seen to protrude, but by the proper manipulation of the hook the lens is delivered with no loss—an excellent testimony to the definiteness and toughness of Professor Anderson Stuart's anterior hyaloid membrane—at times there is loss of vitreous, and the lens has to be delivered on the spoon. The frequency of vitreous lens depends on several factors—the chief being, perhaps, the skill of the operator, and another is the condition of the eye. In my series of over 250 cases the vitreous loss was a little over 8 per cent.

Smith's work, however, has definitely taught us that, within reasonable limits, loss of vitreous is not a very serious thing—the cases do just as well, and, as far as we can judge, the vision is not injuriously affected.

The results of the work I saw in Amritsur were nothing short of brilliant. About 700 cases were operated on—they were mostly dirty, and often trachomatous—four eyes only supplicated—two were lost from hæmorrhage. About 95 per cent. had good eyes when they left on the tenth day. Judging from the few whose vision we tested and found to be $\frac{3}{4}$ or better, the others probably had equally good vision. Iris entanglement was noted in about 7 per cent.

It seems almost needless to point out the advantages in the removal of the capsule—the wound heals up more rapidly and post-operative complications such as iritis were almost totally absent. The absence of secondary cataract or opaque capsule appeals very forcibly to the Indian native, and this fact alone has done much to make the operation popular in India.

An Indian civil surgeon said to me the old operation cannot compete successfully with the Rawal—Smith's operation can. But the greatest advantage lies in the fact that the operation can be done at any time, as soon as the patient's sight is bad enough to incapacitate him we can promise him relief.

In Conclusion.

The question is asked—Will the same good results hold with Europeans as with the Hindoos?

In answer I may say that I see no reason why they should not—and I am content to put the matter to the test, and abide by results. Since my return I have been operating by this method, most of my cases being immature cataracts, and their success has convinced me that the operation is upon right lines. How, otherwise, may I ask, are we to treat immature cataracts. Without the intra-capsular operation, I take it, we are practically helpless. The operation, it may be frankly stated, is more

difficult than the old one, and demands skill and practice on the part of the operator. This consideration, however, does not detract from the merits of the operation—the proposition being that the intra-capsular operation, when properly performed, is the best that can be done in the interest of the patient.

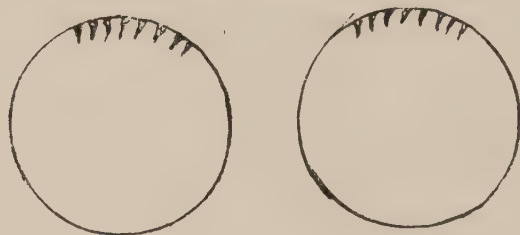
Dr. Weißen and Dr. Halliday's papers on Cataract were discussed together. Drs. GIBSON, ORR, HARTY, MACDONALD, STEVENSON, and the PRESIDENT spoke.

A HITHERTO UNDESCRIBED FORM OF SUPERFICIAL KERATITIS.

By A. MARION THORNETT.

DURING the last three years I have come across two cases of a peculiar form of keratitis, associated with a mild conjunctivitis. The first case was long and obstinate, and refused to yield to any definite treatment. The second was only seen once, but the form of the lesion was so characteristic that I believe it is worth recording, for although I have searched among the medical journals no description of the condition has hitherto been given. The conjunctivitis accompanying the condition—whether causative or not, I do not know—is mild, chronic, and produces slight thickening of the epithelium. The ocular conjunctiva is vascular, especially near the limbus, but otherwise unaffected. A slight white stringy discharge, consisting microscopically of clumps of epithelium entangled in mucus, is present.

2nd CASE.



1st CASE.



After six months.

“Flame-shaped” Superficial Keratitis.

The cornea presents fine vertical striæ, passing from the limbus inwards towards the centre. In one case the lower and inner quadrant only was affected; in the second, the upper quadrant. The condition is bilateral and symmetrical.

With the loupe each individual stria is seen to be shaped like the flame of a candle, the apex of the flame looking as if it were blown slightly to one side by the wind, and the base being at the

limbus. The striæ stain with fluoresceine, the rest of the cornea being clear. The cornea is sensitive, and there was no other inflammation noted in the eye. Cultivations were taken in only one case. The first was sterile; but later, *micrococcus catarrhalis* and *pneumococcus* were both found.

Unless the condition is specially looked for, it is one peculiarly liable to be missed, for it is difficult to see. In an ordinary case of conjunctivitis the loupe is not, as a rule, used to examine the cornea, and this, I take it, is probably the reason the condition has not been noted before.

O.L., a young woman of 25, cook in the suburbs of London, was sent to me by Dr. Mildred Burgess, suffering from an ordinary form of angular conjunctivitis. The case contained nothing unusual, and, after treatment with zinc sulphate and protargol, she professed herself cured in a few days. She also complained of headache, and a slight hypermetropic astigmatism was corrected with glasses which she wore always. Two months later, however, she returned complaining of further irritation of the eyes. The angular conjunctivitis had disappeared, but on closer examination the conjunctiva was found to be slightly thickened in the lower lid, and the ocular conjunctiva was rather vascular, while the cornea was found to be affected in a peculiar manner. The lower and inner quadrant had faint vertical lines rising from the limbus and reaching to about half way to the centre of the pupil. This was seen by the naked eye, but with the loupe each line was found to have a broad base at the conjunctiva, and to taper off to a wavy apex above, looking very much like the flame of a candle, slightly blown to the inner side by the wind. The middle ones were the longest, and the others gradually lessened in size until the end ones finally disappeared. There were twelve or more of these, with a space of clear tissue between each about half the width of the individual flames at the base. They stained faintly with fluoresceine, the spaces between remaining clear. There was no anæsthesia of the cornea. There was no K.P., and the rest of the cornea and eye was healthy. A peculiar thread-like discharge was present, very small in amount, and consisting microscopically of clumps of epithelium entangled in mucus. A swab was taken, but the culture was sterile except for a few groups of *Staphylococcus albus*.

At first I thought of the possibility of it being an artifact, but the peculiar arrangement, the fineness of detail, the regularity and shape of the flames, precluded the idea that she could have directly scratched the cornea herself. She was treated with atropine and ordinary antiseptic lotions and ointments, but with absolutely no improvement whatever. The eyes would cease to irritate for a week or so, but never for more than a very short time, and the trouble occurred again and again.

She was a fine-looking girl, but rather pale, and had had an attack of tuberculosis of the left lung with pleurisy five years before, but which was quite cured in about two years. Her physical condition was thoroughly examined, but nothing abnormal was found. All her mucous membranes were found clean and healthy.

She lived in a house healthy in every respect except in that of ventilation. Her employers were afraid of any air whatever. All windows and doors were shut, and screwed down when possible, and the house was steam-heated. She said that on coming down in the morning she felt like coming into a hot, damp conservatory. Her own bedroom window was screwed up, but the room was a good size, although she shared it with another maid. The kitchen was well lighted, but she did most of her cooking in a smaller back kitchen on a gas-stove, and was never allowed to have either door or window open, so that she felt the heat a good deal.

We came to the conclusion that her eyes were affected by the heat of the stove, combined with lack of fresh air, and she was advised to leave her situation and take to some other kind of work. She liked her position, however, and could not bring herself to leave until nearly a year and nine months had elapsed.

During all this time she had been treated regularly by almost every method that was known. The pupils were dilated, and the conjunctivæ were treated for about two months at a time with different medicaments. Copper sulphate and silver nitrate were painted on twice a week, with no improvement. Instillations of zinc sulphate, zinc chloride, hyd. perchlors, alum, boric acid, hyd. iod., &c., were given in varying strengths, and several times all treatment was suspended, and she was given placebo of normal saline solution. Ung. hyd. ox. flav. dil. 1 per cent., and $\frac{1}{2}$ per cent. was used with no result, and dionine was instilled. The most that was seen under this treatment was that the flames became thinner, looking as if they were beginning to divide longitudinally so that there were more of them.

At one time I carefully pared off the affected epithelium of one eye with a Græfe's knife, and painted the surface with chlorine water. It healed in a few days, leaving no scar, but slowly and gradually the flames reappeared, and in about two months the two corneæ were identical in appearance again. As the new flames appeared they began as points rising from the limbus, and getting longer they finally assumed the shape characteristic of the lesion. A small piece of the conjunctiva was removed and examined microscopically. Mr. Hudson, pathologist at Moorfields, very kindly undertook this for me, and reported nothing more than an excess of goblet cells.

At the end of twenty-one months I took her into the Kensington General Hospital, and had her carefully watched for a month, to see if she put anything into her eyes; but nothing was discovered, and then I took her into my own service, where she lived in good, healthy surroundings, and had a good deal of exercise, and no cooking.

I also had further cultivations taken, and Mr. Browning, bacteriologist to Moorfields Hospital, now found micrococcus catarhalis and pneumococcus. About this time, too, a very slight vaginal discharge was found to have the same organisms; but although vaccines were prepared and injected once a week for about two months, there was no improvement whatever. She also

had an injection of tuberculin, but a severe rise of temperature after it, and the starting of a bad cough made us give up the idea of going on with tuberculin, especially in view of her healed lung.

Then I began to syringe out her lacrymal sacs with a 10 per cent. solution of protargol once a week, with the idea that the source of the infection might be in these, although they appeared to be healthy. She left her old situation in May, 1910, and it was not until November that I noticed any change in the cornea. By December the flames had almost disappeared, and at the New Year the cornea was clear. The conjunctival irritation had become very much less, the eyes would remain quiet for a month at a time, and a slight flare up for a few days would occur. She herself had gained considerably in weight, and was feeling much better.

She then went to service again, and found a situation as cook in a small flat; the kitchen was extremely tiny, with a very hot grate, and she felt the heat very much. She slept in an underground room. In little more than a fortnight she had begun to run down; the eyes were painful, she had headache, and a few flames appeared in the corneæ. She was ordered at once to leave, but remained there about five weeks, and she then found a situation in a more healthy place.

The chief interest in the case lies in the obstinacy it showed to treatment, the difficulty in finding out the cause of the trouble, and its apparent rarity. It was shown to many prominent men in London, including Mr. Holmes Spicer, who has made a special study of the diseases of the corneæ. They had not seen nor heard of a similar condition. Mr. Spicer believed that it was caused by the heat of the fire.

Strangely enough, later on I found another case in Mr. Spicer's own clinic, with exactly the same condition of the cornea; this time, however, not on the lower, but on the upper quadrant of the cornea, and therefore constantly covered by the lids. This man was an electrical engineer, and worked in an underground workshop lit by electric light, and he had also to do with fires and heat. He came once only, complaining of slight trouble with his eyes, lasting a short time, and there was a mild conjunctivitis. He had also a slight hypermetropic astigmatism. He was given a simple lotion, but did not come again, and when I tried to trace him later on he had disappeared.

My own view is that the general conditions under which these people worked were unhealthy. In the case of the cook she had been weakened by her previous attack of tuberculosis, or she may have had some other underlying dyscrasia, and possibly her eyes were thus more easily affected by the heat of the fire. But that it was entirely due to the heat seems to be negatived by the fact that six months after leaving off her work her corneæ were in the same condition, and it was only when she began to get better in health and to put on weight that the corneæ began to clear.

The possibility of her artificially infecting the conjunctiva, either involuntarily or not, must also be borne in mind.

Although this particular form of keratitis has not been described before, it is possible that it is not as rare as it would seem, or two cases would never have come under the observation of one person in less than three years, and probably more cases will now be noticed. The lesion is superficial, and affects the epithelium only, and I believe is somewhat allied to fascicular keratitis, for on several occasions a peculiar greasy appearance of the cornea was noted, and one or two raised spots which stained were seen, which looked remarkably like the small tassels one sees in that condition. This appearance lasted only a few days at most.

I have ventured to call this "flame-shaped" or "flammiiform" keratitis, for the individual striæ are exactly like the flame of a candle.

Why they take this particular form it is difficult to see, for the position and distribution of the blood-vessels, lymph channels, &c., do not appear to favour it. It is probably due to some mild toxin passing into the cornea from the conjunctiva and affecting the part near the limbus; but it is difficult to explain why it should affect only a limited quadrant of the cornea.

In both cases, too, the lids appeared to protect the cornea from any irritation, such as light or heat, the cornea in the region of the palpebral fissure being free from trouble. I have wondered whether the condition might be due to electric light.

I have to thank Mr. Holmes Spicer for advice with regard to treatment, &c., Mr. Hudson for his microscopical investigation, and Mr. Browning, who was indefatigable in preparing the various cultures and vaccines. (Since writing the above paper, I have received a letter from Mr. Browning in answer to one from me asking him to do a Wassermann on the patient. He says that she gave a positive reaction three times, and Mr. Spicer is now treating her with mercury and iodide. There were no stigmata of syphilis about her, and no history to make one suspect it.)

On 22nd September the following operations were performed at St. Vincent's Hospital by Dr. Odillo Maher:—

1. An operation for entropion of the upper eyelid with trichiasis.

This consisted in thoroughly dividing the tarsal cartilage from the under-surface of the lid parallel to, and about $2\frac{1}{8}$ millimetres from its free edge—as in Burow's operation—and fixing with sutures between the edges of the divided cartilage a piece of mucous membrane about 2 or 3 millimetres wide.

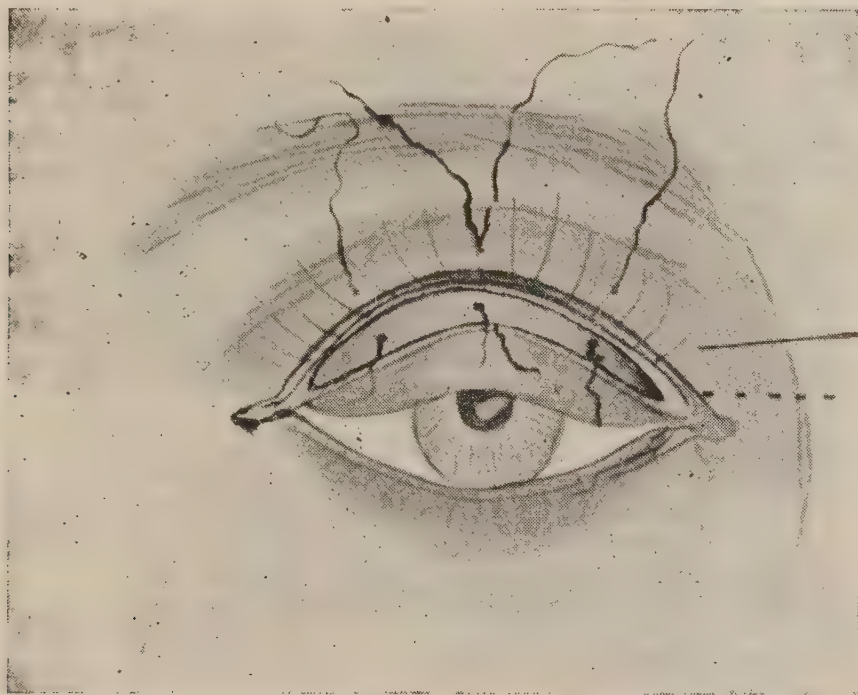
The operation was performed as follows:—

Standing behind the patient the lid was everted, and the cartilage and all the tissues of the lid except the skin were divided with a straight blunt-pointed scissors, parallel to and about $2\frac{1}{2}$ millimetres from the margin of the lid. The lower lid was then clamped with a Snellen's entropion clamp, to prevent hæmorrhage, and a flap of mucous membrane the length of the incision made in the tarsal

cartilage, and from 2 or 3 millimetres wide was marked out by two parallel cuts with a Beer's knife, and removed by a few snips of a scissors.

The mucous membrane was then laid on the tip of the forefinger of the left hand, and all submucous tissue snipped off with a scissors.

Three fine silk sutures, two single and one double, with knots about 2 centimetres from the ends, were used to fix the mucous membrane flap in the slit in the cartilage. The two single sutures were passed through the ends of the flap from the mucous surface, and then through the ends of the cut in the cartilage coming out



on the cutaneous surface of the lid near the canthi. The double suture was then passed through the middle of the flap from its mucous surface, and through the middle of the cut in the cartilage, coming out on the cutaneous surface of the lid midway between the canthi, and a few millimetres from its free edge.

By drawing on these sutures the knots pulled the flap of mucous membrane well in between the cut edges of the cartilage. The sutures were then tied. The single-end sutures were each tied to one thread of the double suture.

The dressing is left undisturbed for about thirty-six hours, when the sutures are removed. The object of having the knots a couple of centimetres from the ends of the sutures is to facilitate their removal. The flap readily takes. A special feature about this operation is that no tissue is removed from the lid, but tissue added, which in a manner replaces that which has undergone absorption.

It produces no disfigurement, and the results are most satisfactory. The effect of the operation can be enhanced by dividing the external canthus.

2. An operation for the cure of epiphora, due to slight eversion of the lower punctum.

After cocainising the lachrymal passage, a Weber's knife was introduced into the lower canaliculus, with its edge directed upwards and slightly backwards, and the canaliculus slit open for about 3 millimetres. One blade of a fine blunt-pointed scissors was then passed through the punctum vertically downwards for about 2 or 3 millimetres—at which point the canaliculus turns at right angles towards the lachrymal sac—and by a snip of the scissors the inner wall of the canaliculus was divided. The triangular flap thus formed by the horizontal slit of the canaliculus, and the vertical cut made by the scissors, was then snipped off. The result of the operation was a small permanent opening into the canaliculus about 1 millimetre in diameter, which lies against the eyeball in the lacus lacrimalis.

The suction action of the sac and canaliculus is not interfered with, and, except in cases where the eversion of the punctum is very marked, the epiphora ceases.

Dr. Odillo Maher showed several cases in which these operations had been performed. He also showed several cases of chronic glaucoma which had been successfully treated by his operation for producing cystoid cicatrices, which he described at the meeting of the Australasian Medical Congress in 1908.

FRIDAY, 22ND SEPTEMBER, 1912.

The President moved, and Dr. Lockhart Gibson seconded, the following resolution:—

That the Congress sympathises with the movement for the better education of spectacle-makers, and is of opinion that a proper course of technical instruction should be provided for those entering the trade.

It is suggested that instruction can be provided by arrangement with technical schools, and that members of the Congress will assist in effecting such arrangements in each State.

That the Congress is of opinion that in the interests of the public no legislation should be introduced which suggests that opticians should be legally authorised to test vision; the relation of the optician to the oculist should be that of the chemist to the physician. That the term oculist should not be assumed by any person except a legally-qualified medical practitioner.

That this resolution be communicated to the Federal and State Parliaments, and to that of the Dominion of New Zealand.

This resolution was carried unanimously.

Delegates were appointed from the States and New Zealand to act as a committee to deal with matters affecting the profession.

THE RELATIONS OF HOMONYMOUS HEMIANOPIA TO SPASMODIC CLOSURE OF ARTERIES, RAISED BLOOD PRESSURE, AND ARTERIO-SCLEROSIS.

By E. A. D'OMBRAIN, M.B.

My reason for introducing this subject to members is to ascertain their views as to a condition found to exist in patients from time to time, who, in conjunction with hemianopia, have evidences of circulatory disorder, or abnormality, as shown by—

- (a) Increased or high blood-pressure ;
- (b) Arterio-sclerosis ; or
- (c) Both of these conditions together ;

and to enable us, if possible, to arrive at such a conclusion with regard to these conditions as to permit us to make a statement to such patients from a prognostic standpoint, or to enable us to warn them of a possible happening with regard to their vision.

It has no doubt fallen to the lot of those who have had wider experience than myself to have had quite a number of patients who had suddenly lost half their field of vision of the same side of each eye—*i.e.*, homonymous hemianopia. During the past two years I have had some four or five cases, and as all of these had increased blood-pressure or arterio-sclerosis, or, as often happens, both of these conditions combined, the question naturally arose as to what part was being played by these conditions as a casual factor in producing the hemianopia.

The site of any lesion of the circulation causing such homonymous hemianopia is, of course, broadly, in the optical centres in the cerebrum ; and, without entering into the question of exact anatomical position, we may accept this fact, namely, that there is an interference with the nutriment of a certain part of the brain, through its vessels, that causes blindness of the corresponding half of each eye.

It is not intended to include all cases of hemianopia, such as those caused by trauma, as shown to occur by writers such as J. Herbert Fisher ;* or those cases of homonymous hemianopia caused by cerebral hæmorrhage, as evidenced by loss of power in the limbs, the so-called paralytic stroke with which all are familiar.

For here in these cases we have the direct result of a known lesion which can be demonstrated and proved in the *post-mortem* examination ; nor do I include embolism cases, where there is a heart lesion to account for the condition. The cases I wish to refer to are those where, quite suddenly, usually, the patients find they have lost half of their field of vision without experiencing much, or any, sensation themselves beyond loss of sight, and are in apparently good health.

* Ophthalmological Anatomy, J. H. Fisher, 1906.

I will briefly refer to the cases of my own knowledge, and, after doing so, would like an expression of opinion from those present as to what they consider the immediate cause of the disturbance in these particular cases, and of their views on predisposition to hemianopia in cases showing similar evidences of circulatory disorder.

This is of importance, and we are not so much concerned here as to the exact site of the lesion—though this has been experimentally demonstrated—as we are with regard to prognosis, and the possibility of such a happening as I refer to; in other words, taking more the clinical than the anatomical aspect.

The theory has been advanced that arteries have the power of spasmodically closing (“claudication”), and, later, regaining their former calibre; or, failing to do so from some cause, remaining closed and causing either a temporary or permanent effect. In the visual cortical areas of the brain, when this takes place the result is frequently hemianopia of a temporary or permanent nature.

This argument has been lately advanced by Dr. Wm. Russell,[†] who has endeavoured to prove that temporary or intermittent closure occurs in certain cerebral arteries (arterioles?), leading to impairment or suspension of function of the part affected, as shown by disturbances of a sensory nature.

According to Russell, this closure is caused by a contractility of the muscular coat, and occurs in a local, not general, fashion; and, according as it is partial or total, so we get as a result either impaired function or complete suspension. These are patients who can often give a history of “dead” fingers, the distal digits becoming temporarily numb, regaining sensation later.

The following notes of cases, which, while they are certainly not of any intermittent nor temporary class, because a sufficient length of time has now elapsed for them to have had their lost function restored, are, nevertheless, of such a nature as to cause one to ask the question above alluded to, viz.: Are we to presume that those are liable to hemianopia who have high blood-pressure or arteriosclerosis?

Case 1.—Patient, male, aged 45, labourer, was in hospital for some weeks, being treated for chronic renal disease, with hypertrophy of the heart. Sent to out-patients eye department, Sydney Hospital, for eye examination, owing to his noticing obscuration of vision coming on fairly suddenly. No history of specific disease. On examination, left hemianopia of each eye; arteries sclerosed—silver-wire variety; pressure on veins at crossing; no retinitis; no “corkscrew” vessels.

Case 2.—Male, aged 64. No history of specific disease. Has taken alcohol freely. A year ago was looking on at a cricket match; suddenly found he could not see half of the cricket ground on looking straight ahead. No loss of con-

[†] British Medical Journal, October 16, 1909.

sciousness. On examination, left hemianopia. V.R. and L. $\frac{6}{6}$. His family doctor stated his blood-pressure is raised, though there is nothing very suggestive in his retinal vessels, though the radial and other arteries feel sclerosed. Also, in this case there is a history of doubtful cerebral seizure ten years before, when, after gardening, he was dizzy and unconscious two hours. Again, one evening a few years later he had vertigo, fell, and was again unconscious two hours. No eye symptoms on either occasion. These attacks were completely without after-effect. Seen after a year the condition of fields practically was unaltered.

Case 3.—Male, aged 53. Gives a history of hemianopia occurring simultaneously with a mild hemiplegia, which followed severe headache and retching. No loss of consciousness. Blood-pressure much raised. This patient is of the full-blooded, plethoric type. Fundus showed thickened arteries and distended veins, and a generally congested appearance of the retina. Right hemianopia. It is now two years since I saw this case, which has improved as to his direct vision, which was lessened, thus showing a difference from the preceding cases, in which direct vision was not affected. His field of vision has also slightly improved, as shown by his charted fields.

Case 4.—Male, aged 59. Subject to bladder trouble, tubercular in nature. In this case the patient found on awakening one morning that he could see only dimly, especially objects on his right-hand side. No loss of consciousness, but felt dazed and had hazy ideas. Five days later I first saw him, and his fundus showed nothing markedly characteristic of arterial change, but he had "quilly" radials, and all surface capillaries of the face were markedly dilated. No history of lues. Hemianopia of left-sided variety. Blood-pressure was raised. Condition nearly a year later practically unchanged.

Case 5.—Female, aged 55. This case was seen two years ago. She was practically an invalid. She gave a history of circulatory trouble, and was under treatment at the time for exceedingly high blood-pressure, for which it was necessary to repeatedly bleed her. She spent a lot of her time reading, which she did lying down. As she frequently read lying on her side she found that she could not see so well as sitting up or holding the book directly in front. There was hemianopia. Her reading-glasses needed strengthening, and this was done. My last information about her condition was that the sight had considerably improved, and she was able to see things on her sides better than before. As far as I could establish, the hemianopia in this case did not come suddenly, but of this there was no certainty.

TO SUMMARISE.

All the cases, except one, were males.

All had homonymous hemianopia occurring more or less suddenly.

All had pulsating veins on the disc.

None had loss of consciousness at time of occurrence.

One case only was hemiplegic, and is the only one that has shown any degree of improvement.

All showed raised blood-pressure by the instrument.

Whatever the nature of the cause, it is my opinion that in all these cases of hemianopia one can always detect either increase in the blood-pressure or arterio-sclerosis, or both.

As to the relation of these two conditions, alone or combined, to spasmodic closure, it is at present difficult to speak with certainty, and the physiology of the so-called claudication is still unsettled.

The balance of physiologists' opinion is, I understand, in favour of little, if any, vaso-motor influence.

The assertion that arteries in the cerebrum can close intermittently by action of the muscular coat has been denied. G. Parker,‡ in commenting on Russell's paper, declares that the physiology is not sound, for (he states) the reason that cerebral arteries show no contractility experimentally, either by stimulation of the vaso-motor centres nor by the injection of pressor substances (the suggested cause in renal cases), and that these arteries have feeble contractility compared with the systemic vessels.

On the other hand, there are others who find in the theory a solution of the cause of epileptic conditions, aphasia, and temporary aberrations, and allied states. Is it conceivable that vessels which are admittedly feeble in contractile power can suddenly collapse and remain so for a longer or shorter period, and gradually regain their calibre?

Why should this take place in one localised part of the brain in particular?

Would a minute hæmorrhage be a more likely cause than closure by muscular contraction?

Are the vessels supplying the lateral cortical areas in themselves more prone to be affected than those supplying other areas; and if so, why?

It has been suggested that parts of the occipital visual cortex are less freely supplied with blood than the supposed macular centre, and thus trying to explain the preservation of direct vision in these cases of homonymous lateral hemianopia of cortical origin.

J. H. Fisher§ states that "no anatomical evidence can be adduced" in support of this hypothesis.

‡ British Medical Journal, 1909.

§ J. H. Fisher, 1906

Finally, are these patients who present evidences of circulatory disorder—from any cause—to be warned of the disturbance likely, as there appears to be likelihood, to occur to them?

These are the questions, then, that naturally crop up and require answering.

Perhaps there are amongst us members who have given this some thought, and have an answer to some or all of the queries, and can throw some light on what is at present an obscure corner in ophthalmology.

This paper was discussed by Drs. GIBSON, HERZ, and the PRESIDENT.

ASTIGMATISM AND HEADACHE.

By S. H. HUGHES, F.R.C.S. (Eng.).

Hon. Ophthalmic Surgeon, Lewisham Hospital, and Hon. Ophthalmic Surgeon,
Newcastle Hospital.

THE subject, I am sorry to say, is not a new one, but one I venture to think of great interest to the ophthalmic surgeon. The idea of writing this short paper was suggested by reading an article sent to me by Mr. A. Greene Brinton, which had been read for him before the South African Medical Congress of 1910. The title of the paper was "Diagnosis and treatment of Headache due to diseases and disturbances of the Eye, Ear, Throat, and Nose." His paper again was, I imagine, suggested by that of Mr. R. W. Doyne on the "Value and misuse of Spectacles in the treatment of Headache, Migraine, and other functional troubles of the Eyes," which appeared in the April number of the *British Medical Journal*, 1910. Mr. Brinton in his paper analyses some 2,500 cases of refraction, and draws certain conclusions therefrom. Having careful notes of some thousands of cases, it occurred to me that it might prove interesting to the ophthalmic branch of the Australian Medical Congress if I examined some of these, and read a paper thereon. For this purpose I have taken 2,030 consecutive cases from my notes of private cases. They have all been examined under similar conditions, all under a mydriatic, and all by retinoscopy; the only conditions I venture to think that gives uniform and accurate results from which we are justified in drawing definite conclusions. The various symptoms included under the term "eye-strain" are most numerous, but I think the following list will include most of them—headache, pains in the eyes, intolerance to bright light, giddiness, sleepiness, insomnia, pain back of the neck, spasm and twitchings of orbicularis, hyperæmia, and thickening of conjunctiva, &c. Doyne rather scoffs at those who find in errors of refraction the cause of appendicitis and tubercle, yet says polyuria is a common symptom. To go into all these symptoms thoroughly would need more time than I have at my disposal, so I propose to confine my energies to the symptom headache.

Headaches may be divided into two main varieties, nervous, and sick headache. The only difference between them is, that in one there is

sickness, and in the other there is not. It is a simple distinction. Nervous headache seems to me to be a bad term, because all headaches are nervous, and therefore it is unnecessary to add the word nervous. The most frequent positions for ocular headache are the frontal and occipital regions, in fact headaches in these positions are almost always due to eye-strain.

These headaches are due to a peripheral irritation of the branches of the ophthalmic divisions of the fifth nerve. How this irritation exactly produces a headache is not known, but Lauder Brunton says it is brought about by a proximal dilatation combined with a peripheral contraction of the arteries of the head and neck. Whether this is so or no, I am not in a position to say, but I am inclined to think it is due to the former. That it is due, no matter how it is brought about, to an increased blood pressure within the cranial cavity seems to me to be tolerably certain. In proof of this we cure these headaches by lowering the blood pressure through dilatation of the splanchnic area by drugs (other than analgesics) which act in this way. I take it that a simple purge acts in this manner. The cause of this peripheral irritation of the branches of the ophthalmic division of the fifth nerve are various, such as anisometropia, monocular diplopia, failure of accommodation, heterophoria, &c., but I will endeavour to show that the greatest cause of all is astigmatism. Doyme says the error he most frequently finds associated with headache is anisometropia; he says it is *facile princeps* the cause of headache. He however never mentions astigmatism as a cause of headache. Doyme comments on the rarity of headache in the one-eyed and squinters. This he looks upon as proof of ocular headache being due to disturbance of the fusion centre.

Mr. Brinton analyses 2,500 cases—838 came because of severe headache, *i.e.*, 30 per cent. Of these, twelve had no error of refraction = 1.25 per cent., whilst seventeen had simple hyperopia or myopia without astigmatism—roughly 1.3 per cent. Then 614 had astigmatism of less than 1 D. (one dioptré), the latter he considers the most important error. In conclusion, he says, "I emphatically lay it down that the most prevalent cause of headache is astigmatism of under one dioptré."

The further theory of ocular headache being due to disturbance of the fusion centre is not borne out by his statistics which he says do not show a large percentage of anisometropia. He is also of the opinion "that where astigmatism is great, say two dioptries or over, the symptom headache is rare but vision is bad."

Mr. Wood who read the paper for Mr. Brinton, analysed 1,000 of his own cases and found astigmatism in 60 per cent. Mr. Wood states that headaches produced by glare to which he gives the name "sun-headache," were due to "retinal hyperæsthesia." He further says "the bright light of South Africa produced overaction of the orbicularis and corrugator supercilii, which produced just such a headache as did an optical or eye muscle defect. In such, the only means of relief lay in the use of dark glasses." One would like to know what proof Mr. Wood can bring forward to support this theory regarding the orbicularis and corrugator supercilii, let alone the "retinal hyperæsthesia." On the other hand there is abundant evidence to prove that these headaches are due to astigmatism. They are very common in Australia, but we

do not attempt to cure them with dark glasses (which I regard as most unscientific); no, we correct their astigmatism. I suffer from these headaches myself, and am sure to get one if I go boating, from the glare off the water. If I wear my glasses the headaches do not occur; should I be without the glasses for a little while, I get a headache, but even then, if I do not wait too long before putting the glasses on, they will cure the trouble. Whenever I see a person wearing dark glasses for the relief of glare, I know he has been to someone who either could not, or would not, correct his astigmatism. My own 2,030 consecutive cases were analysed thus—

There were none without an error of refraction, and none without astigmatism.

2,028 had astigmatism of 0·25 or over.

2 had astigmatism of less than 0·25.

190 ,, ,, 0·25.

1,284 ,, ,, 1 d or under.

175 ,, ,, 3 d and over.

379 ,, ,, over 1 d and under 3 d.

These figures show, provided my estimation is correct, that astigmatism is present in all cases, and that emmetropia, or an anatomically normal eye, does not exist. Brinton in 838 cases found emmetropia in twelve, and seventeen without astigmatism. Forty per cent. of Wood's cases had no astigmatism. Doyne speaks of emmetropia as a common condition. That the absence of astigmatism or the presence of emmetropia is very rare (if such conditions exist) I am firmly convinced. I have often wondered why we differ so in our findings of error of refraction. Is it because we have no uniform method of examination? I know there are some who still labour under the fond delusion that they can correct errors of refraction accurately without a mydriatic, and I am quite convinced it is impossible—leaving presbyopia, of course, out of the question. I can remember some of the older ophthalmic surgeons who thought it unnecessary to correct astigmatism below 1 d, and some doubted its existence. Let me enter a plea for the examination, under a mydriatic, of all those with symptoms of eye-strain.

Of these cases 1,292 complained of headache in a greater or lesser degree = 63 per cent. Of the 1,284 with astigmatism of 1 d and under, 854 had headache = 66 per cent. Of the 190 astigmatics of 0·25, 140 had headache = 75 per cent.

According to these figures the most potent error in the causation of headache is 0·25 d. This would agree fairly well with Brinton's findings. He found "the most prevalent cause of headache is astigmatism of under one dioptre."

There seems to be a general impression amongst ophthalmic surgeons that high degrees of emmetropia are less liable to headaches than low. Brinton finds that "where the astigmatism is great, say 2 d or over, the symptom headache is rare, but vision bad." This is not supported in these cases, 175 of whom had astigmatism of 3 d and over, and 55 per cent. of them suffered from headache. It is hard to understand what gave rise to the idea that high degrees were more or less free from headaches, but I think it is because we see nearly all the people with high

degrees, and only a very small percentage of those with low degrees. Patients with high degrees come to the ophthalmic surgeon for two reasons, one because they do not see well, and the other because they have some troublesome symptom such as headache. The people with low degrees only come to us for one of these reasons, because of symptoms, not because their vision is bad. The majority of those with low degrees we do not see because they have no trouble. Were we able to examine the whole population, I am sure we should find headaches much more common amongst those with high degrees.

That the desire for fusion is a great cause of headache, I think we will all agree. Doyne says it is *facile princeps* the cause of headaches.

A great percentage of those with anisometropia have headaches, but the condition is not common. In these cases there were twenty-one with anisometropia, and sixteen of them suffered with headache = 76 per cent. A little higher than in those with 0.25 d.

Mr. Doyne in his paper comments on the immunity of squinters and one-eyed people from headaches as a proof of disturbance of fusion centre. Amongst these cases were five people with one eye, and four of them had headache = 80 per cent.—one with typical migraine with scintillating scotoma. Although five cases are hardly enough to draw general conclusions from, still it seems a fairly conclusive answer to Mr. Doyne's theorising. Mr. Doyne, again, mentions monocular diplopia as a cause of headache. There were only *two* with this trouble, but neither had headache. Monocular diplopia is a rare condition in Australia, and indeed so it was in England when I lived there.

Dr. LOCKHART GIBSON had listened with great interest to Dr. Hughes' paper. It is a fact that those patients who see $\frac{5}{6}$ when they consult us, owing to refraction headaches, are the cases most benefited by glasses.

It is because they, as a rule, have small errors, and their ciliary muscles insist on their constant correction. When the errors are large ones, the ciliary muscles are only brought into action to correct them when accurate sight is specially required. Many cases, with the higher degrees of emmetropia, though capable perhaps of binocular vision, unconsciously practice monocular vision, suppressing the image on the retina of the eye, which at that time is not chosen for vision. Some such cases use sometimes the one, and sometimes the other eye, and without squinting.

He agreed that in the small degrees of emmetropia, the smallest degrees of astigmatism, at least down to .25 d., should be corrected. In fact, he corrected down to .25 d. in all but very large errors. He found anisometropia, even without astigmatism, a fruitful source of headache. He had found an alteration of the angle of a cylinder by half a degree, make all the difference in the world to a highly strung patient. He did not believe that the ordering of glasses for possibly refraction headaches was likely to cause lasting benefit, unless they were ordered for constant wear. He did not expect his patients to see as well in the distance as he wished with the glasses ordered until they had worn them constantly for, at least, a month.

Why do people who have suffered with headaches all their lives frequently lose them between the ages of forty and fifty? Has it any relation to the loss of accommodation? I am inclined to think this is

the explanation; if so, it would seem to support the theory that these headaches are due to fatigue and overaction of the ciliary muscle in attempting to overcome the astigmatic defect, and produces a well-defined image on the retina.

Here in Australia with an excessive amount of light, and with no green in many places to relieve the glare, slight errors of refraction give rise to symptoms more often than in colder climates. The necessity for careful and accurate estimation of errors of refraction becomes imperative.

To sum up, I come to the conclusion that everyone has an error of refraction, and that everyone has astigmatism. That of all the causes of ocular headache astigmatism is the greatest and principal one.

It might appear from the foregoing that I consider everyone in possession of a refractive error should wear glasses. This is not so. The determining factor in the wearing of glasses is the possession of symptoms, and symptoms of sufficient magnitude. Slight symptoms may be disregarded, as the inconvenience of wearing glasses might exceed that of the symptoms.

Drs. KENNY, BAUR, GIBSON, STEVENSON, and the PRESIDENT joined in the discussion.

NOTES ON TWO UNCLASSIFIED FORMS OF CONJUNCTIVITIS.

J. P. RYAN, L.R.C.S., I., M.R.Q.C.P., I., &c.

Surgeon, Victoria Eye and Ear Hospital, Melbourne.

(Read by the President in Dr. Ryan's absence.)

ONE of these I have named *retrotarsal conjunctivitis*, from its site, the other *cretaceous conjunctivitis*, because of its main characteristic, the exudation of carbonate of lime. The former is common enough, the latter is rare, for in a hospital practice extending over thirty years, only two cases of it have come under my notice. Neither of them is accorded a place in the text-books dealing with diseases of the eye, and only on one occasion, and in an American periodical have I come across a notice of what I have termed *cretaceous conjunctivitis*. The latter is so remarkable in its principal manifestation, that I am at a loss to account for the absence of any description of it by writers on diseases of the eye. It is different with *retrotarsal conjunctivitis*, which is confined to the *retrotarsal fold* of the upper lid, and might easily be overlooked or confounded with other inflammations which affect the same "locale." And yet as it is to be met with so frequently, and is remarkable for its especially chosen site, it surely deserves to be placed in a category by itself.

Retrotarsal Conjunctivitis

is a sub-acute or chronic inflammation of the mucous lining of the upper lid, and generally affects both eyes simultaneously. In a majority of cases there are few or no symptoms to point to its existence, and only by thorough eversion of the lid and complete exposure of the sulcus is the inflammatory condition made visible.

Then it is that the contrast between the nearly white or pale pink colour of the lining membrane of the lower part of the lid, and the red and congested aspect of the upper and more loosely attached mucous lining of the sulcus becomes at once so manifest. In a minority of cases

there is some irritation, an increased flow of tears, and even a small amount of mucous discharge which may glue the lids in the morning, as well as some feeling of heat and uneasiness which may induce the patient to rub the eyes, and draw his attention to the fact that there is something wrong with them. Now and again, and probably as the result of a superadded infection, the inflammation spreads over the whole surface to the border, extends to the lower lid, and becomes a general conjunctivitis in which the former more localised one is covered up and lost sight of for a time. Should this new phase of things last for any considerable period the lining membrane of the upper lid, and particularly of the retrotarsal fold, becomes thickened and velvety-looking, with considerable hypertrophy of the papillæ, and then the affection somewhat resembles, and may easily enough be mistaken for, trachoma. Any difficulty, however, about the diagnosis will soon disappear for the condition is much more amenable to treatment than is trachoma, there is no pannus, and the "sago grain" granulations, so characteristic of the latter, are at no time to be made out—but the inflammation and thickening of the upper retrotarsal fold remain, and the bluish-red colouring due to enlargement of its blood-vessels is more remarkable than ever.

It is reasonably open to question whether the condition which I have just described is really pathological. On account of its looser attachment along the fornix, the lining membrane of the lid here differs somewhat in appearance from the lower part which is more firmly attached to the solid underlying structures of the tarsal portion. Anyone who will take the trouble of carefully examining the children of a large school, or charitable institution, will not fail to find cases corresponding to the above. But to discover them the eversion of the lid must be complete. This manœuvre is of course greatly facilitated by the previous instillation of a 5 per cent. solution of cocaine, but it has the disadvantage of causing contraction of the vessels and pallor of the mucous membrane. But in any case the general engorgement, the thickening of this membrane and enlargement of its papillæ will be evident.

Cretaceous Conjunctivitis.

In the early part of 1899, a girl 8 years old was brought to me on account of what appeared at first to be an ordinary attack of mucopurulent conjunctivitis. The mother informed me that the child had been bad for over two months and that from time to time a whitish powder collected in the corners of her eyes, and she produced a small quantity of it in a piece of paper. It looked like chalk, and on analysis proved to be so.

I asked her if by any chance the child herself or her sisters or playmates might have put the powder in her eyes. She said she did not think it was likely, for this probability had occurred to her; she therefore made careful inquiry among the children and they all denied having in any way tampered with the patient's eyes. The chalky exudation was not generally noticeable during the daytime, but in the morning after the night's rest, it collected in the outer and inner canthi as a whitish scum. The child did not complain of pain, but must have suffered considerably from irritation, for she was constantly blinking and rubbing the eyes with her hands. She made but little improvement under treatment, so after some weeks I lost sight of her.

A second and much more remarkable case was that of A.S., aged 18 years, whom I first saw towards the end of 1900. She was an inmate of a charitable institution, and I had the fullest opportunity of watching the course and progress of the disease, and of controlling the conditions under which the patient lived. When first seen she had an attack of catarrhal conjunctivitis, which apparently disappeared in the course of a few weeks. In May, 1901, she had a somewhat similar attack, which improved under treatment but did not quite clear up, and it was during the warm weather at the close of the year when she had to be kept in bed for some days on account of threatened appendicitis, that the chalky deposit was first noticed.

Some weeks after this she was again laid up in bed with a sprained ankle, and at this time both eyes were red and inflamed, and the exudation of whitish powder was sufficiently remarkable. The girl was somewhat weak in intellect, and not quite reliable in her statements, and though she denied putting anything into her eyes, I did not feel quite sure that she might not have done so. Henceforth and for considerable periods, on account of the suspicion of malingering, she was carefully and constantly watched. Towards the end of the year as both the tarsal and globar conjunctiva was badly affected, as the cornea at last became implicated in the inflammation, I took her into the Victorian Eye and Ear Hospital, where she remained, most of the time in bed, for nearly five weeks.

The amount of the chalky exudation was now remarkable. It occurred in two forms—as a greyish powder, and as pellets, some as large as the head of an ordinary pin. These were no doubt shaped by the movements of the lids. The exudation, often in considerable masses, accumulated at the inner and outer canthi, and especially in the fornici, but was always loose and unattached to the tissues. The resident surgeon of the hospital, on account of the constant large quantity of chalky material found within the patient's lids, and because one of the nurses stated she found her tampering with her eyes, became convinced that she was malingering, and that she obtained the powder from some outside source. Accordingly a careful watch was set upon her, but nothing was discovered to warrant this conclusion. For a considerable time after returning to the charitable institution to which she belonged, I had her carefully watched, and I adopted all sorts of dodges and put in practice many devices for finding out if by any chance she was playing me false. For instance, after carefully cleansing the eyes and closing the lids with strips of isinglass plaster, I put on an elaborate dressing of folded gauze and cotton wool held in place by numerous turns of bandage, and outside all long strips of rubber plaster extending from the roots of the hair on the forehead to underneath the lower jaw. This was left on for twenty-four hours.

Next day, on removing the dressing, which could not in the meantime have been tampered with or removed without the fact becoming at once evident to me, the chalky exudation was as plentiful as usual. This I repeated on several other occasions, and always with the same result. The course of the disease was somewhat varied, and lasted over several years, at times the severity of the inflammation declined, the exudation of chalky matter ceased entirely, and it appeared as if the patient were about to get well. But this was a mere delusive amelioration, to be soon followed by a relapse, and in a few weeks she was as bad as ever. By

the middle of 1907 the disease had worn itself out, and the condition of the patients' eyes was as follows, and is virtually the same at the present time:—

$$\left. \begin{array}{l} \text{V.R.} = \frac{1}{2} \text{ Jg. 16. at 3 inches} \\ \text{60.} \\ \text{V.L.} = 1\frac{1}{2} \text{ Jg. 8. at 4 inches} \\ \text{60.} \end{array} \right\} \begin{array}{l} \text{V.R.} = \frac{1}{2} \text{ and Jg. 16 at 3 inches.} \\ \text{60.} \\ \text{No material improvement with glasses.} \\ \text{V.L.} = 1\frac{1}{2} \text{ and Jg. 8 at 4 inches.} \\ \text{60.} \end{array}$$

Both eyes are affected with symblepharon, but the movement of the globes is not materially restricted thereby; the conjunctivæ are xerosed in patches, and whitish. More or less dense opacities occupy more than the lower and outer third of each cornea, and impinge on the area of the pupils. The right pupil is almost covered. The irides are normal as is the tension of both globes; the details of the fundi could not be made out. From this it will be seen that although recovery took place, it left the patient with seriously damaged eyes.

In addition to the disease just described, lime salts are found as secretions or deposits in the eyes under three other conditions: as concretions in the meibomian glands and follicles, as calcareous degeneration of the cornea, both superficial and deep, and in the conjunctivitis petrificans of Leber, in which the deposit is said to occur in thin scales on both the ocular and palpebral mucous membrane, to which they are adherent. Conjunctivitis petrificans undoubtedly bears a strong resemblance to the inflammation described by me, though whether it is identical with it is not so certain. In any case it is little known, and not described or referred to in the text-books, it is comparatively mild in character, and does not permanently damage either the eyes or the vision.

SOME POINTS IN THE OCULAR HYGIENE OF SCHOOLS.

By G. H. HOGG, M.D.

It has long been known by the medical profession that the strain of school life plays an important part in the development of eye disease, and it may be interesting to note in this relation, that as early as 1648, a law was made in Würtemberg compelling the use of good paper and print in the making of school books, and that in 1746 Kaiser Franz's commission legislated against bad paper and bad print. In 1800 Beer dealt with the question of the eye in relation to school life in his work "Healthy and Weak Eyes," but it was the writings of Cohn and Javal much later in the century that did so much to draw attention to the necessity of the proper care of the eyes at school.

My visits to Tasmanian schools have brought under my notice many defects which have a most harmful influence on the eyes of the children, and in this respect Tasmania is probably not the only transgressor. The hygiene of the eye at school is dependent chiefly upon—

1. The lighting of the schoolroom.
2. The school desk and seat.
3. The character of the work—sewing, reading, &c.

As to the first two matters, viz., lighting and furniture, I will not enter into details, save to insist on their absolute importance, and to

remark that although this is universally acknowledged, too many school authorities still fail apparently to realise the importance of a correct scheme of lighting and of hygienic school furniture.

Bad lighting and bad desks and seats are injurious enough in themselves, but when to these are added improper tasks, whether of sewing or reading, we have a combination of all the factors productive of eye mischief. It is more particularly the tasks which children are doing to which in this brief note I wish to call attention, and just a few words in regard to books.

As you are doubtless aware, Dr. Hermann Cohn, of Breslau, who investigated this question thoroughly, is of opinion that taking the roman "n" as a basis for measurement, all type which is less than 1.5 mm. in height is harmful to the eyes, and should be prohibited; the smallest leading which should be allowed is 2.5 mm., and the greatest length of the line should not exceed 9 cm., at the most 10 cm.

As regards the thickness of the letters, the down stroke should be at the very least 0.26 mm. thick, and according to Schneller 0.3 mm.

Griffing and Franz in their investigations showed how a greater time is taken to read the smaller type, and fatigue therefore more easily induced, and how the strength of the light necessary to read with increases rapidly as the size of the type diminishes.

This is a most important point, for in many of our schools the lighting is at times much below the normal standard, and consequently if the size of the print, &c., is too small, the strain and fatigue of the eyes is much increased.

I have made an examination of books in use in our schools, and the following table gives a summary of my findings. From it you may see that hardly a book conforms to the rule, and that Cohn's minimum is constantly being exceeded.

Model book.			Books examined.	
Type of book.	Size of letters.	Leading.	Size of letters.	Leading.
1st. Reading book	2.6 mm.	4.5 mm.	2 mm.	3 m.
Poetry in 1st reading book ...	.....	.....	1.5 mm.	3 m.
2nd Reading book	2 mm.	4 mm.	2 mm.	3 m.
Poetry ... ..	.....	.....	1.5 mm.	3 mm.
3rd Reading book	1.8 mm.	3.6 mm.	1.5 mm. and less	2 mm.
Poetry ... ..	.....	.....	1 mm.	1.5 mm.
4th Reading book	1.6 mm.	3 mm.	1.5 mm. and less	2 mm.
Some small type in book ...	.....	.....	0.75 mm.	1 mm.
Verses of music ... ..	.....	.....	0.50 mm.	1 mm.
5th Reading book	1.6 mm.	3 mm.	1.5 mm. and less	2 mm.
Small type ... ..	.....	.....	0.75 mm.	1 mm.
Arithmetic book	1.6 mm.	3 mm.	1.0 mm.	1.50 mm.

Length of line in some books was 11.4 cm.

The first measurements are the minimum ones which are approved by scientific authorities.

The second measurements are those found in the school books examined.

For some time my attention has been drawn to the bad conditions obtaining in sewing classes, and I have complained to the Education Department regarding them.

Sewing occupies an important position in the schoolwork of girls and submits their eyes to an additional strain which the boys escape

And in this relation I would remark that in my experience, the proportion of girls suffering from symptoms of eye-strain is higher than that of boys, the chief reason being that, in addition to their ordinary work, girls are usually burdened with the additional tasks of sewing and music. I am afraid that few of our educational authorities realise the importance of seeing that this branch of schoolwork is properly taught; the teachers are too often laws unto themselves, and transgress all the rules of eye hygiene.

In Australia, so far as I know, there is no proper regulation of the teaching of sewing. New Zealand has rules which forbid the use of material and stitches fine enough to injure the children's eyesight, but in the first class of this and other States, hemming and oversewing are taught, whereas no such work should be given to children under 9 to 10 years of age.

In West Australia it is ordered that all materials should be white, but sewing drill which has been condemned in England is prescribed.

In Victoria no notice is taken of the size of needles and stitches, &c., and sewing drill is taught.

In Tasmania sewing drill is not taught, but there is no attempt at teaching this branch on proper lines.

In some of the sewing classes which I visited, I have found extremely fine work being done by girls of from 12-14 years of age; for instance, in some work which I examined I have found from forty to forty-eight stitches to the inch, and that sometimes in a room where the illumination was very bad.

This was a strain to my own eyes to count even in a good light. What must it have been to a child working in a badly-lighted room?

On watching classes engaged in needlework I have noticed—

1. Many children holding their work within 4 or 5 inches of their faces, some frowning with that peering expression which accompanies strain of this kind.
2. Some children squinting.
3. Some children grimacing, putting out their tongues, twisting or opening their mouths.

(Dr. Louise Woodcock of London has reported similar conditions in certain schools.)

I would suggest that to remedy these defects in the ocular hygiene of school there should be—

1. A proper illumination of all school-rooms.
2. A supply of hygienic desks and seats.
3. All school books should be modelled on Cohn's rules.
4. Sewing should be taught on correct principles, and as elementary rules I would suggest that—
 - (a) Children be not allowed to hold their sewing nearer to the eyes than 12 inches.
 - (b) Fine sewing of any kind be reduced to a minimum, and no fine work be taught to children below the age of 12 years.
 - (c) Young children must not be taught stitches of more than five or six to the inch.

VIII.

SECTION OF PSYCHOLOGICAL MEDICINE
AND NEUROLOGY.

PRESIDENT'S ADDRESS.

W. BEATTIE SMITH, F.R.C.S., L.R.C.P. (Edin.), Melbourne.

My first duty is to express my deep sense of the very great honor you have extended to me in asking me to preside over this Section of Neurology and Psychiatry. That duty is at the same time a real pleasure, but a pleasure that is sadly dimmed by the realisation of my own shortcomings in any attempt to deliver the address which is expected of him who speaks with the authority of the presidential office. Perhaps it will come as a blessed relief to you if I say at the outset that I do not propose to make that attempt. Indifferent health of late has prevented my giving the necessary application to the work of preparing a closely-reasoned argument, or making any presentation of minute or detailed observations; moreover, I realise that I am speaking in the capital of New South Wales—a State in which the organisation and equipment for dealing with the theoretical and practical handling of mental diseases has been brought to a condition of perfection second to none existing in any other community in the world. I realise that I am here in the midst of a body of workers in this special field of alienist medicine to whom it would be waste of time, if indeed it were not impertinence, to attempt to take any ground with which they were not perfectly familiar. Yet the time you indulgently place at my disposal may perhaps be not unprofitably spent in taking counsel together as to any measure that might possibly lead to some new outlook upon problems with which we are confronted. The public Press not infrequently sets the heading “Is Insanity increasing?” and though we answer evasively, the query must be the cause of grave misgiving each time it comes up for consideration in our own minds. With all the improvements of modern years—improvements of medical education and official cures, the numbers in our hospitals are growing.

The subjoined tables, which have been kindly prepared for me, show for New South Wales and Victoria how, during a long period of years, the admissions, discharges, and increases have affected the proportion per population.

VICTORIA.

TABLES showing Admissions, Discharges, Deaths, &c.; Total number of Insane at the end of each year; Increase for year; and Proportion of Insane to Population, in the Hospitals for the Insane for the years 1863 to 1910.

Year.	Admissions.	Recovered, relieved, and died.	Total remaining at the end of the year.	Increase.	Decrease.	Proportion admissions to population.
1868	507	307	1,556	...	...	1 in 1,331
1869	535	382	1,705	149	...	1 in 1,308
1870	566	411	1,849	144	...	1 in 1,284
1871	546	356	2,037	188	...	1 in 1,369
1872	571	344	2,263	226	...	1 in 1,329
1873	585	492	2,346	83	...	1 in 1,319
1874	552	456	2,438	92	...	1 in 1,419
1875	577	470	2,537	99	...	1 in 1,371
1876	587	503	2,613	76	...	1 in 1,366
1877	570	458	2,719	106	...	1 in 1,431
1878	560	404	2,866	147	...	1 in 1,477
1879	585	445	3,002	136	...	1 in 1,437
1880	547	503	3,048	46	...	1 in 1,572
1881	544	424	3,163	115	...	1 in 1,617
1882	465	471	3,147	...	16	1 in 1,934
1883	480	427	3,193	46	...	1 in 1,918
1884	547	511	3,228	35	...	1 in 1,727
1885	519	507	3,230	2	...	1 in 1,867
1886	595	452	3,378	148	...	1 in 1,681
1887	662	521	3,516	138	...	1 in 1,560
1888	648	532	3,632	116	...	1 in 1,662
1889	665	659	3,627	...	5	1 in 1,659
1890	749	599	3,769	142	...	1 in 1,513
1891	745	641	3,868	99	...	1 in 1,554
1892	706	611	3,954	86	...	1 in 1,655
1893	680	591	4,038	84	...	1 in 1,729
1894	695	610	4,116	78	...	1 in 1,701
1895	654	612	4,148	32	...	1 in 1,813
1896	689	626	4,204	56	...	1 in 1,713
1897	776	627	4,341	137	...	1 in 1,524
1898	720	664	4,394	53	...	1 in 1,643
1899	792	778	4,398	4	...	1 in 1,502
1900	701	694	4,399	1	...	1 in 1,708
1901	769	656	4,501	102	...	1 in 1,574
1902	796	745	4,547	46	...	1 in 1,522
1903	766	737	4,570	23	...	1 in 1,578
1904	748	668	4,642	72	...	1 in 1,618
1905	741	609	4,771	129	...	1 in 1,644
1906	862	672	4,937	166	...	1 in 1,436
1907	817	663	5,052	115	...	1 in 1,539
1908	825	727	5,111	59	...	1 in 1,543
1909	849	626	5,200	89	...	1 in 1,528
1910	883	688	5,349	149	...	1 in 1,493

NEW SOUTH WALES.

Year.	Admissions.	Recovered, relieved, and died.	Total remaining at the end of each year.	Increase.	Proportion of admissions to population.
1863	187	...	.....	...	1 in 2,026
1864	199	146	.....	53	1 in 1,973
1865	182	129	.....	53	1 in 2,260
1866	196	119	.....	77	1 in 2,201
1867	181	140	.....	41	1 in 2,473
1868	223	148	.....	75	1 in 2,093
1869	265	269	1,226	4 Dc.	1 in 1,831
1870	253	190	1,289	63	1 in 1,987
1871	340	242	1,387	98	1 in 1,527
1872	303	250	1,440	53	1 in 1,779
1873	342	256	1,526	86	1 in 1,638
1874	330	268	1,588	62	1 in 1,770
1875	356	247	1,697	109	1 in 1,704
1876	360	317	1,740	43	1 in 1,749
1877	457	354	1,829	89	1 in 1,449
1878	424	337	1,916	87	.....
1879	440	337	2,011	95	.....
1880	476	375	2,099	88	1 in 1,618
1881	494	351	2,218	119	1 in 1,581
1882	473	384	2,307	89	1 in 1,728
1883	476	380	2,403	96	1 in 1,826
1884	493	395	2,524	121	1 in 1,868
1885	567	448	2,643	119	1 in 1,729
1886	567	493	2,717	74	1 in 1,817
1887	532	428	2,821	104	1 in 1,960
1888	588	511	2,898	76	1 in 1,846
1889	550	474	2,974	76	1 in 2,040
1890	611	483	3,102	128	1 in 1,914
1891	596	564	3,134	32	1 in 1,955
1892	666	488	3,312	178	1 in 1,797
1893	688	575	3,425	113	1 in 1,778
1894	712	550	3,587	162	1 in 1,757
1895	715	586	3,716	133	1 in 1,787
1896	740	615	3,841	125	1 in 1,753
1897	692	582	3,951	112	1 in 1,912
1898	730	617	4,064	116	1 in 1,844
1899	796	662	4,198	144	1 in 1,704
1900	859	681	4,376	179	1 in 1,585
1901	848	749	4,475	92	1 in 1,627
1902	947	749	4,673	199	1 in 1,484
1903	1,065	803	4,935	263	1 in 1,344
1904	1,020	880	5,075	147	1 in 1,432
1905	1,009	832	5,252	180	1 in 1,482
1906	1,123	878	5,497	248	1 in 1,363
1907	977	898	5,576	82	1 in 1,608
1908	969	872	5,673	98	1 in 1,655
1909	1,070	841	5,902	229	1 in 1,538
1910	1,221	975	6,148	243	1 in 1,384

Since 1869 the total admissions to the Victorian hospitals have been 27,924, and in New South Wales since 1863 the number is 28,308. The proportions of admissions to the population in 1910 was in Victoria, 1 in 1,493 or .67 per thousand, and in New South Wales, 1 in 1,384 or .72 per thousand. The proportion of the total insane at 31st December, 1910 in Victoria, 5,349, to the population was 1 in 246.5 or 4.07 per thousand, and in New South Wales, 6,148 or 1 in 274, or 3.72 per thousand.

Grant that our diagnosis is daily becoming more accurate. Grant that many mental defectives, of whom no official cognisance was taken in the past, are daily being brought under efficient treatment, the reflection still comes home that the perfection of organisation in the recognition and treatment of insanity is not the goal towards which we are striving. It is with the beginnings of mental disorder that we hope for victory. It is with the causes of insanity that we must grapple if our work is ultimately to be crowned with that success for which all our effort is made. In common with physicians in other departments of medicine, we have put on the armour of bacteriology, but it cannot be said that as yet we have got quite accustomed to the new harness, and adapted it precisely to our own special needs. Somewhere no doubt at the back of all men's minds from time immemorial, the conception of "toxins" as a basis for mental disorder has vaguely been formulated whether it be under the biblical idea of the casting out of devils, or the more prosaic and not less efficient modern procedure of administering a smart purge to overcome the gloomy mental atmosphere born of a torpid liver or overloaded intestine. And though the first of our own special bacterial organisms, the diphtheroid bacillus of Forde-Robertson, has not as yet wholly sustained the etiological role attributed to it by its distinguished discoverer, yet there is no question that in the future we shall come to some more certain knowledge in the same direction, and find that other organisms, at present known and unknown, have a special vogue in bringing about those conditions which we know recognise either by actual anatomical nervous tissue changes, or by mental instability in particular directions. But when bacteriological research has laid bare the form and substance of every organism for which we seek, when every bacillus is under our microscope, there is still the problem of the "soil" in which the "seeds" of mental disorder takes root, and the recognition of the conditions which predispose to such a happening.

Up to the present we have been content to group the causative factors of insanity under general headings, and even these general headings are largely filled up according to the personal bias of the particular recorder. What do these assigned causes denote. By whom are they assigned, and what value is to be placed upon them? They usually denote the most recent illness, worries or losses, &c., &c., under table-names; they are assigned by the relatives, and not by the examining medical men, and very little reliance can be placed upon them, even if they should be checked and altered for the purposes of treatment. Suppose for a moment that special inquiry sheets are sent to the friends, how varied the interpretation of the answers according to the individual officer who receives them.

The Victorian hospitals issue the following circular to relatives on reception of a patient:—

Will.....be good enough to answer the following questions relating to the patient above named?

Not only in the interests of the patients, but in the welfare of the whole community, it is desirable that these queries should be correctly answered; at the same time, it should be understood that the communication will be regarded as a strictly confidential one.

.....Medical Superintendent.

1. What history is there, if any, of insanity amongst patient's relatives, either on mother's or father's side?
2. What history is there, if any, of alcoholism amongst patient's relatives, either on mother's or father's side?
3. What history is there, if any, of phthisis (or consumption) amongst patient's relatives, either on mother's or father's side?
4. What history is there, if any, of nervous affections amongst patient's relatives, either on mother's or father's side?

Such causation is of no real value for diagnosis in classification. Take for example the report of the Inspector-General of Insane for last year, and we find a table showing the probable causes of insanity for the year's admissions, which of course follows the classification ordinarily adopted in all British asylums. These causes are grouped under two general headings—Moral and Physical. Under the first we have mental anxiety, domestic trouble, adverse circumstances, religious excitement and the like; and under the second, various others—the one bulking most largely in the present return, save that of “unknown,” being “intemperance in drink.” I do not suppose anyone will question that this factor of alcoholic intemperance as a cause of insanity is one that appeals most strongly to the lay mind, and it seems that we, as medical men, have consciously or unconsciously been affected by a like leaning towards such a causative factor.

I select this particular heading for the purpose of my remarks, because it is one upon which grave doubt has lately been thrown by a very competent neurologist, who is also a very competent general physician. At the annual meeting of the British Medical Association for 1910, Dr. F. W. Mott read a paper in the section of pathology entitled “The Nervous System in Chronic Alcoholism,” which doubtless you have all read, so that there is no need for me to do more than remind you of Dr. Mott's principal conclusion. He said the fact that but few cases of advanced cirrhosis of the liver are found in the asylums, and that these occur in cases either of general paralysis, alcoholic dementia, or Korsakow's disease, both of which latter only occur after prolonged intemperance, suggests *a priori* that in the great majority of the cases of alcoholic insanity, alcohol acts as a co-efficient to some other factor peculiar to the individual. This hypothesis is supported—

1. By the relatively large number of cases of advanced cirrhosis of liver dying in hospital, and presenting no mental symptoms.
2. By the variability of percentages of alcohol as a cause for insanity in the different London asylums as shown by statistics extending over thirteen years.
3. By the regional dissociation of drunkenness and insanity, as shown by a comparison of maritime and manufacturing communities with rural communities; this being explicable by the mental and physical deterioration of the agricultural population of England owing to the immigration of better types to the industrial centres.

I must be particularly careful in this direction to disclaim that anything said under this heading is to be construed into an argument for or against the use of alcohol as a beverage. Alcoholic intemperance is an admitted and deplorable social problem, but at the present moment

I am not dealing with it in any light other than its relative importance as a cause of insanity, about which opinion is still divergent. Now, whether we agree with Dr. Mott's contention to the full or not, it seems that a study of his position must give us pause, and bring the reflection that the other headings under which we are accustomed to assign patients will also bear critical examination and reconsideration.

With the single exception of heredity, under which a certain amount of exactness is possible from our own investigation, all the other headings are to a large extent hypothetical—much more so than that of alcoholic excess—and if we are prepared to admit, as it seems to me we must, that our alcoholic factor has been over-stated, the larger admission follows, that some of the other assigned causes may likewise be weighed in the balance and found wanting.

There exists an International Committee for the study and Prophylaxis of Mental Diseases, a good outline of which was published in the *Journal of Mental Science* for July of last year. The movement was initiated by Dr. Ludwig Frank, of Zurich, in 1906, who made a formal appeal to found such a body, and this proposal was warmly upheld by psychiatrists in various countries. An international committee was formed for the purpose of co-ordinating the work, and almost every country but our own nominated representatives.

Whether or not on the score of geographical ignorance or impossibility of situation, no Australian name appears in a very long list of leaders of psychiatric medicine in other parts of the world. Dr. Percy Smith writes of a meeting in 1908: "The question of whether the committee should directly undertake investigation into the causes of insanity was raised by the French delegates, with a proposal that an international laboratory for research of an elaborate and scientific kind should be established in Paris. Such a proposal did not commend itself to the majority of members, and we (the English delegates) gave notice of a motion to the effect that the committee should, instead of undertaking direct research work themselves, take means to ascertain the kind of work bearing on their objects which is being carried on in various laboratories and institutes throughout the world, and select for encouragement, material assistance, and publication, the researches of such workers as may appear to them most useful. The motion was unanimously adopted at the second session of the committee." Dr. Smith further very properly writes, with a note of warning as to the limitations of even such a vast undertaking: "We do not mean to suggest that any measures are even likely to be successful in preventing the occurrence of insanity, for it is not one disease, or due to any one set of causes. We believe that many of the forms of insanity are originally due to innate germinal variations which cannot be controlled, and which must always occur from time to time, even in the most healthy human stock; but we cannot doubt that other forms, if not directly due to, are at any rate promoted by, unfavourable social environments and physical diseases, the nature of which is at present imperfectly understood."

That is a position to which we can all cordially subscribe, and it only remains to us to ask what we in Australia can do to assist in such an investigation as is here outlined. In some respects we are exceptionally favourably situated. We have abundance of material and excellent

organisation already assured. We have a small community in which causes can be more clearly discovered, and we are far from many of the distressing complications of abject poverty which complicate the outlook in older countries.

The probability of aid from the inspection of school children in getting some idea of the beginnings of mental degeneracy, and the factors of social environment, heredity, &c., is under the notice of the Medical Staff of the Education Department, who inform me that it is diligently being pursued, and material tabulated to be published by themselves. Aid also should come from acute mental hospitals and receiving houses, and much might be done through the suggestive beginning in New South Wales by Dr. Kate Hogg in the study of gynaecological conditions, a matter elaborately dealt with by Mr. Tennison Collins at the Cardiff City Mental Hospital, and reported in the *Journal of Mental Science* for April of this year.

We have long wanted such from a British authority, the continental and American records being thus confronted.

Time permits no reference to general factors, but to quote Greisinger, who wrote as far back as 1845 and 1861: "We do not consider it possible that the question whether insanity originates more frequently from physical or from somatic causes can be solved by statistics alone. Any discussion of the statistics relating to the subject from the days of Pinel to the present time may be dispensed with." The same is surely true now.

Lastly, is there any special line in which an investigation that might prove helpful could be undertaken in our own midst?

Dr. Sydney Coupland published last year a very exhaustive attempt to correlate the causes of insanity from the study of the vast collection of asylum statistics, but as he himself says: "May I finally mention what must be apparent to all, that every such collective inquiry is imperfect, by reason of the very fact that it is collective. No two recorders can be of precisely the same opinion in their estimation of evidence, or the import of a fact; there are bound to be differences, not only as to the value of a fact in life history, but even to such terms as 'sudden,' 'prolonged,' 'intemperance,' 'privation,' and the like."

It has seemed to me that an investigation on somewhat different lines might be productive of result. Let a competent pathologist be attached to one of our asylums for a period, with no other object than to attempt from clinical knowledge and his *post mortem* examinations, the grouping of cases sent down to him with a given causative factor. Let him ask himself in each case, not the cause of death, but whether there is any finding, macroscopic or microscopic, which would enable him to say of such and such a case, "This belongs to the group of alcoholic intemperance," or "This to mental anxiety," or "This to bodily disease," or any of the tabulated factors. He would not assign causes at all, but look for any evidence, however minute, supporting the idea that any two or more cases sent to him with an already specified cause could be so grouped from the pathological point of view. It will probably be objected that such an inquiry would be unproductive of result, and a waste of time. To such an objection I would rejoin that even a negative result would be to achieve some result, and that to

achieve any result is never a waste of time. A negative result from such an inquiry carefully, conducted, would at least make us more than ever dissatisfied with our present basis of assigning factors of causation, and to be dissatisfied and more dissatisfied with any position is the first step towards its betterment. Twenty years ago such an inquiry would have been impossible, but with the improvement of staining methods, and better knowledge of minute tissue changes, twenty years hence it may be much easier, but it would be easier still for the pathologist of that day if some standard of comparison were ready to his hand.

It would be to deceive ourselves and deceive the public if we spoke of insanity ever being entirely prevented. It would likewise be to deceive the public and ourselves if we looked towards the multiplication and elaboration of asylum and institutional control as the highest end of psychiatric study. But the recognition of preventable and curable cases of insanity is a work which carries, not merely the saving of public funds, but the alleviation of a vast amount of human misery.

The cost of buildings in Victoria up to the end of 1910 is approximately £1,000,000, and the total cost of maintenance from 1869 to 1910, inclusive, is £4,431,758. In New South Wales the amount spent on buildings up to the present time is £1,205,544, and the total cost of maintenance from 1879 to 1910, inclusive, was £2,419,643. The apparent discrepancy in these figures is accounted for by the fact that there is ten years difference in time, and that in the earlier years Victoria had larger numbers than New South Wales; hence the additional cost per head and total cost.

Doubtless these figures are well within the mark, there being many votes from which supplies come for furniture, repairs, renewals, &c., &c.

I cannot finish my remarks without paying tribute to the work of the Pathological Department of the New South Wales Hospitals for Insane, with its central and subsidiary laboratories. Mention must also be made of the fact that while in Victoria we have not had that full use of the pathologist that was intended and expected, an enthusiastic young medical officer, Dr. Lind, skilled in ward work, has been permitted to go to Europe for the purpose of study in this direction—a notable departure. Rich opportunity for study will present themselves when the Victorian Acute Mental Hospital, with its equipment, is used for the purpose for which it was built.

A whole time departmental pathologist should, however, be appointed and adequately paid to work in conjunction with a neurological laboratory at the Melbourne University. Some such scheme is at present under consideration, and we may hope to hear some definite views on this matter during our discussions. Here I leave my suggestions.

In conclusion, these few desultory words will not have been in vain if I have brought home to the minds of those young and eager spirits gathered here, that we, who daily witness the loss of human reason, and the widespread terror and suffering such a happening entails, should be upheld by the conviction that any conscientious effort to establish the causes of insanity on a more exact basis, however barren of result, will at least never merit the reproach of waste of time.

THE HOSPITAL TREATMENT OF INSANITY WITHOUT CERTIFICATION.

By W. ERNEST JONES, M.R.C.S. (Lond.).

Inspector-General of Insane, Victoria.

INSANITY has been known and recognised for such a very long time that it is almost a matter for wonder that we are not very much better acquainted with its pathology and symptomatology. It is true we are commencing to know a good deal more of the pathology of insanity, but with regard to the causation of each individual case we are not infrequently far too ignorant.

The progress of our knowledge of psychology and of our treatment of mental diseases has been inhibited largely by the ignorance and superstition which surrounded these subjects during the Middle Ages. Hippocrates, Galen, and other ancient writers recognised the existence of insanity, and wrote most intelligently on it, and had a very clear appreciation of the necessity of treatment; but insanity at that time was not looked upon with the same degree of horror as it came to be later on; in fact, the insane were treated alongside those suffering from bodily disorders as a matter of ordinary routine.

Very little is known of the treatment of mental disorders for many centuries, but somewhere about the end of the thirteenth century it became the custom to imprison the insane in separate gaols, or in certain monastic institutions—that is to say, the treatment of mental disorders was alienated from the systematic science of medicine.

Towards the end of the eighteenth century certain celebrated humanitarians took a hand in improving the lot of the insane. Such names as Pinel, Esquirol, Tuke, and Paul have only to be mentioned to show how at this time public attention was being drawn to this subject. Possibly the insanity of King George III also did a great deal to fix public interest in this direction. Nevertheless, the medical profession was somewhat slow in realising the possibility of proper treatment. One might instance, for example, the fact that the leading authority in attendance on George III was a layman named Willis, and it was about this time that institutions commenced to be built for the segregation of the insane throughout the Continent and England and the United States.

As the nineteenth century grew older the necessity for reverting to the hospital treatment of mental disorders became more and more apparent. The physical basis of insanity was recognised, and propositions were put forward for the treatment of early cases of mental disorder in the wards of the general hospitals and infirmaries. In this direction Scotland has always taken the lead. Such authorities as Laycock, Clouston, McPherson, Batty-Tuke, and Carswell made strenuous endeavours to obtain the erection of special wards in the big Royal Infirmaries in Edinburgh and Glasgow.

About the same time the psychiatric clinics of Germany, which have been extensively copied in the United States, came into being, and more recently at the London and St. Thomas' Hospitals out-

patient clinics have been formed; still more recently, Dr. Henry Maudsley has, with a golden bait, endeavoured to induce the London County Council to provide a mental hospital for—

- (a) The early treatment of insanity and mental diseases.
- (b) Research work on this subject and the allied neuroses; and
- (c) The education of medical students and the training of asylum medical officers in the recognition and treatment of insanity.

Perhaps Germany has set us the best example in the establishment of her psychiatric clinics, the best known of these being that at Munich, which is presided over so ably by Kraepelin, the genius to whom we are principally indebted for our recent advances in the nomenclature and etiology of this subject. From these clinics we have begun to recognise that, admirable as are our British general asylums, we are behindhand in the treatment of our more recoverable forms of mental disorder, and that in this, that most powerful fetish—the liberty of the subject—has played a more important and vital part in delaying the early treatment of mental disorders than anything else that I can think of.

If an individual becomes sick with the premonitory symptoms of typhoid, we do not wait until the spots have come out and other more certain symptoms have appeared before we put that patient to bed and start medical treatment. But this, I maintain, we do when we deny to the early case of mental disorder the right to enter an institution in which alone he is likely to obtain the treatment which is essential for his complete recovery.

The general hospitals of Australia have as yet made no recognised provision for the treatment of mental disorders. Some seven or eight years ago, in Victoria, these hospitals were approached by the Lunacy Department to ascertain whether it would be possible for them to set aside a ward or beds for the reception and observation of such cases. Without exception, the hospitals always respectfully declined, and it was therefore found necessary to fall back on a principle which had been so excellently started in New South Wales, primarily by Dr. Manning, of establishing a Receiving House for the observation of doubtful cases of mental disorder. In Victoria we have followed this lead, and attempted to go a little more in the direction of treatment, and especially quite recently this has been possible in the erection of the Mental Hospital. Unfortunately, the necessary legislation to give full effect to the Mental Hospital ideals has not been forthcoming, and we have therefore found it necessary to act in a somewhat illegal manner and permit the admission to our wards of voluntary patients without any legal authority for having done so. This brings us to the first proposition as to what we should do. We should secure from the Legislature the recognition of the voluntary principle. This will have to be catered for in two ways. We must consider the private institution as well as the public hospitals. Admission to the latter might be obtained by a voluntary request from the intended patient to the medical superintendent of the institution. The necessary safeguards could be obtained, and, in my opinion, the clauses in the bills which were

drafted for the Legislatures of New Zealand, New South Wales, and Victoria would amply provide for security, not only to the patient, but also to the official admitting him.

With regard to the private institution, however, seeing that a patient is also retained in them for the purpose of gain, it seems to me that it is necessary that the voluntary application should be made to some judicial authority before the applicant is admitted. I have to suggest that an application to a justice of the peace would suffice in this direction.

Another early step which might be taken to secure proper treatment of mental disorders could be known as "preliminary notification." We have all seen from time to time cases of early slight and transient mental disorders which could very well be treated in the home of the patient—as, for example, a case of puerperal insanity, where the symptoms are not very severe or very dangerous. I conceive that it would be of the greatest moral support to the medical practitioner attending such a case if he had the right to report to the central lunacy authority that there was such a case under his care, and that it was desirable, in the interests of the case, that certification should not be resorted to, and that it was possible to provide sufficient nursing attendance to render the treatment of the patient secure. It would, of course, be possible for the lunacy authority to inspect as a result of such notification, and I have no doubt whatever that in very many cases the friends would welcome such a course. Possibly this would not be a very popular step at first, but I believe that in time the public would recognise that it had very many manifest advantages.

The most difficult class of cases that we shall have to deal with from a legislative point of view are those acute cases who could be certified, and who should be admitted to an institution, but who are likely to recover in a comparatively short time, in which case the fact of their certification might be regarded as a slur on them for ever after. Obviously these patients are unable to make voluntary application for admission. The only thing that I can suggest is that power should be given to the next-of-kin to apply to the medical superintendent of a Government institution for the insane for the admission of the patient for a stated period of time to that institution, and power should be given to the medical superintendent to decline to take such a case unless under certificate. In all these cases, whatever be the legislative procedure or the red-tape rules and regulations imposed by the Act itself, there is no one thing that is so important as the question of inspection. Whether the institution be a Government one or a private one, the frequent and thorough visits paid by the inspector or the commissioners or their deputies are, in my opinion, the one essential. Again, with such thorough inspection I do not think the public will hesitate to send their mentally afflicted to these institutions at the earliest possible moment.

We can, of course, achieve this object much more readily if we are dealing with small separate hospitals, for it seems to me that the public will find it difficult to differentiate between the mental hospital ward attached to a big hospital for the insane and the big institution itself, whereas they will think very much less of the

disgrace—if disgrace it can be called—if their demented relative has merely gone to a comparatively small, well-staffed and well-equipped institution which is recognised definitely as being especially established for the reception of incipient and recoverable forms of mental disorder.

It is true that in Victoria it was practically impossible to adopt any other course than this; but I thought at the time that it was the wisest course, and further experience confirms me in that opinion. I feel convinced that the admission of voluntary patients to our institutions will do good in many ways, will stimulate our officials generally in their duties, and will do much to dispel the atmosphere of distrust and suspicion which envelops even the very best of our more modern hospitals for the insane.

CARE OF THE SUSPECTED INSANE IN GENERAL HOSPITALS.

By S. H. O. MONTGOMERY, M.B., M.S. (R.U.I.),

Inspector-General of Insane, W.A.

AMONGST the many problems that face the alienist, that of the care and treatment of the suspected insane is not the least important. To my mind, there is only one way—that is, treatment in general hospitals—for the following reasons:—

As will be seen later, a very large proportion of the cases admitted are either not insane, or their insanity is of a purely temporary character, probably caused by alcohol.

Now, no matter how admirable the special institutions such as reception houses may be, the fact that a man or woman has been admitted there brands them as insane in the eyes of the public, and this is of great detriment to them in the future.

It is not only the lay public who look upon the person suffering from mental illness with aversion, but a large body of the medical profession are imbued with the same idea, otherwise the general hospital would afford these sick people a place for treatment in many more instances than it does.

Another reason is that many of the suspected insane are not insane, but mentally run-down, and the fact that they have been admitted to a general hospital will not affect them adversely, while the shock caused by the knowledge that they have been admitted to a reception house for the insane, or, worse still, a police cell, may be the last straw required to upset their mental balance.

Although at that time the police cell was the abode of the suspected insane in Western Australia, in the year 1903 provision was made in a new Lunacy Act for the admission of suspected insane to a general hospital.

It was enacted that “the Government may, by notification in the Government Gazette, declare the wards of any hospital or infirmary for the care and treatment of the sick, or of any benevolent asylum, which may be set apart for such purpose by the committee, or the person in whose hands is vested the management of such hospital, infirmary, or benevolent asylum, to be wards for the temporary reception of the insane, and thereupon the Minister shall make regulations for the dietary, treatment, and inspection of such wards.”

The Act goes on to explain that patients shall be admitted by an order from a justice of the peace, and that he cannot be detained more than fourteen days unless the medical officer of the hospital certifies in writing that the patient is not in a fit state to be removed, and presents this to the visiting medical officer on his next visit.

To a Western Australian public hospital (the Perth Public Hospital) belongs the honour of being the first hospital to open a ward for the suspected insane, and so help in a sane, sympathetic, and scientific manner the treatment of the mentally afflicted.

In 1908 a male and female ward was built in connection with this hospital by the Government, with the consent of the committee, which was set apart for the admission of suspected insane cases.

The two wards are in one building, and are at a little distance from the main buildings. This, to me, does not seem to be a very important matter, and even in hospitals with little or no ground I see no reason why the ward should not be in the main building, as I am a firm believer in bed for at least a fortnight in all cases of mental illness, and this is the term of detention specified by the Lunacy Act.

The building being erected, the next matter was to arrange between the hospital committee and the Lunacy Department a *modus vivendi*. It was arranged finally that the Lunacy Department should provide the male staff and pay 4s. 6d. for each day of residence in the mental ward of any male patient admitted to a hospital for the insane; and that the Perth Hospital should provide the female staff and receive 6s. for each day of residence in the mental ward of each female patient admitted to a hospital for the insane.

The visiting staff of the public hospital attend to the mental patients without interference. The male nursing staff supplied by the Lunacy Department are responsible to the public hospital management for their conduct.

The Inspector-General of the Insane has the right of visiting this ward when he desires, and inspecting the patients and certain books—i.e., admission and discharge books.

I may here say that this arrangement has worked without a hitch since its inception, and has been so successful that a mental ward has been started, and is almost erected, in connection with Kalgoorlie Hospital, and plans are being prepared for wards in connection with Northam and Albany Hospitals.

In all probability, in two or three years mental wards will be attached to every hospital of any importance in Western Australia.

This is all leading up to the third proof of my theory, which is as follows:—

During the year beginning 1st July, 1909, and ending 30th June, 1910, 118 patients were admitted to the mental ward, viz., 98 males and 20 females.

Of the males, 42 were admitted to the Hospital for the Insane, 2 died, whilst 54 or 55 per cent. of the total admissions were discharged as not insane or as cured.

Of the females, 18 were admitted to the Hospital for the Insane, whilst 2 were discharged.

During the following year 127 patients were admitted to the mental ward—104 males and 23 females. Of the males, 54 were admitted to the Hospital for the Insane, 1 died, whilst 49—or 47 per cent.—were discharged. Of the females, 19 were admitted to the Hospital for the Insane, and 4 were discharged.

The result of the two years' work, then, is: that 103 out of 212 males admitted, and 6 women out of 43 admitted, have been spared the stigma of insanity. Surely these figures should make those who oppose this method of treatment pause before opposing it further.

A fourth reason in its favour is one which should appeal to all medical men. We all know how ignorant we are of mental diseases when we leave the University as qualified medical men. This is not as it should be, but we can always shift the responsibility of these cases on someone more learned in these matters than ourselves; but when we come to the trained nurse this is a more serious matter.

How many of our trained nurses have ever seen a case of insanity? How many would be capable of efficiently attending to a case of puerperal mania?

We have got to remember that this land does not consist of the large cities only; that hospitals for the insane are not in every centre; and that someone must care for these cases until they are sent to such an institution. Shall it be the policeman, or the physician and nurse? Shall they be sent as soon as possible to a hospital for the insane? Or shall they be given a chance in the mental ward of a general hospital? Gentlemen, it rests entirely with you.

When I strongly urge this method of treatment—and, in fact, have started it in Western Australia—I wish you to understand that I have everything to lose, and nothing to gain.

This large number of recoveries in the mental ward would all have been added to swell my recovery rate, and it is the ambition of all men in charge of hospitals to have a good recovery rate.

It also increases my death-rate, and gives to another institution all the "kudos." But in such a proposition as this is, these matters are of no importance whatever.

Now, what objection can be taken to this line of action? Why do the hospital authorities forbid it? I can see none, at any rate, sufficiently great that it cannot be overcome.

The first, I presume, is, that if admitted, the mental cases would disturb the other patients in the hospital.

In practice this is not so; at any rate, it has not occurred in the Perth Hospital. These cases are in a separate ward. They are not noisy and violent cases, as these would be sent straight away to the Hospital for the Insane, the diagnosis being clear, the only exceptions being alcoholic cases, and these are admitted to hospitals every day under the name of delirium tremens.

The second would be that the hospital staff are not suitable to nurse these cases.

There might be some reason in this if female nurses had to nurse male mental cases; but this is not so. The Lunacy Departments of the various States would, I feel sure, supply the male staff, and female staff also if required, although I think our arrangement is better, as it gives the female staff of the general hospital a chance to learn something about mental diseases.

A third objection might be brought forward, which is, that mental cases are better under mental experts.

This may be so, but certainly it would not apply to such cities as Sydney, Melbourne, &c., where there are mental specialists, not connected with the Hospital for the Insane, who, I am sure, would be only too pleased to act as honorary visiting physicians to these cases.

A fourth is the extra expense to the hospital authorities. With regard to the ward accommodation, the Government should provide that, or rent it, if a portion of a building already erected is used.

The salaries of the male staff in Western Australia are paid by the Lunacy Department. The maintenance of all patients finally admitted to the Hospital for the Insane is also paid by the Lunacy Department. Of course any arrangement could be made which would be agreeable to both parties.

The final objection might be that the hospital authorities and the Lunacy Department might find it difficult to work together; but this is a matter which should not be allowed to stand in the way of a reform which is undoubtedly a step in the right direction.

To sum up briefly, then, the advantages are:—

1. Many persons are not admitted to a hospital for the insane who otherwise would be, and so escape the stigma of being insane. In Perth alone, this number in two years was 109.
2. Many borderland cases recover who, if admitted to a reception house or police cell, would have become insane through shock.

As I thought you might like to hear both sides of the question, I asked Dr. Tymms, the Medical Superintendent of the Perth Public Hospital—who has seen the ward since its inception, and to whose kind assistance with the committee I owe permission that this ward, then quite an experiment, be built—for a few remarks from his standpoint.

Before this ward was built persons under criminal charges, who were suspected of being insane, were admitted to the hospital by order of the magistrate, and Dr. Tymms gives his experience of them:—

“Regarding the mental ward which was built in the grounds of the Perth Hospital by the Government on your recommendation in August, 1908, I cannot speak too highly of the great boon this has been for patients who have been admitted here since its inception.

“Previous to this a small cottage was used for the reception of mental and refractory patients, and when the magistrates remanded a person alleged to be of unsound mind for medical observation, police constables were supplied to continuously watch these patients and prevent their escape, on three shifts of eight hours each in the twenty-four hours.

“These constables took no part whatever in the care or nursing treatment of the patients which was carried out by hospital orderlies (with no special knowledge) for males, and the female cases were attended by the nursing staff.

“This arrangement proved very unsatisfactory, both for the patients themselves and those who nursed and treated them, and

was a source of constant worry and anxiety to myself. There was in no sense any adequate curative treatment provided, but rather a form of imprisonment better than could be supplied in the lock-up.

"At the present time we have a modern brick building, consisting of a ward for ten male patients and five female patients, each separate from the other in every way, but adjoining each other.

"In connection with the male ward there are two single rooms, one padded cell, bath-room, W.C. lavatory, day-room for meals, and the attendants' room adjoining the main ward; whilst the arrangement for female cases comprises a small ward of four beds, a padded cell, bath-room, W.C. lavatory, day-room for meals, and the attendant nurses' room.

"Every three weeks two experienced male attendants are supplied from the staff of the Claremont Hospital for the Insane, one on day duty from 7 a.m. to 7 p.m. and from 7 p.m. to 7 a.m. respectively. These attendants are relieved for meals during the day-time by one of the hospital orderlies.

"The patients, on admission, are treated just as any other case in the hospital, and are put to bed and temperature charts kept, and are visited daily by myself, and also on the visits of the honorary medical officer under whom they are placed.

"Restraint is not found necessary except in very violent cases, and visitors being shown over the ward have remarked from time to time how little the appearance of the ward suggested that the patients were mental cases.

"Those patients who are improving are allowed to assist in the ward work, and otherwise employ themselves.

"Up to the end of June, 1911, there were 577 cases treated in these wards.

"In addition to the patients remanded by two justices for medical examination, all cases certified by one medical practitioner when a second is not obtainable, and who are committed on an emergency order, are admitted also; and if found to improve under treatment and become sane, are discharged by the order of two justices.

"In these cases no stigma of insanity on the patient remains, as they have been treated in the hospital, and have never been to the Hospital for the Insane.

"The management of the Perth Hospital have made use of the male ward for cases other than those remanded by the court, such as cases of delirium tremens or insanity developing in the general wards of the hospital, until they are removed to the asylum.

"Up to the 30th June, 1911, altogether 182 patients, male and female, were sent to the Hospital for the Insane, 14 died, and 381 were discharged in the care of their friends, or discharged by the magistrates."

Gentlemen, I am very sorry that, by force of circumstances, I have been prevented from being present at the Congress and taking part in the discussions, also that for the same reason I have not been able to give the time I would have wished to this subject.

My paper is only a skeleton, but I hope that it will be sufficient to cause discussion on this subject, and be the means of weakening the opposition of general hospitals to the hospital treatment of suspected insane.

THE HOSPITAL TREATMENT OF EARLY INSANITY.

By M. H. DOWNEY, M.B., Ch.B. (Melb.), L.R.C.P. & S. (Ed.).

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UNTIL comparatively recent times incipient mental disorder in its various forms seldom came under early observation and treatment. In fact, it was only when an individual's conduct became so abnormal, or so dangerous or obnoxious to himself or others, that such individual was placed in an institution for the insane. By this time bad habits of mind have been set up, because the central nervous system has a functional tendency to form organised tracts—or, in other words, habits—which, when once formed, are very difficult to eradicate. Even in these days, when such good work is being done in the direction of scientific observation and treatment by means of reception-houses, acute mental hospitals, and mental wards in general hospitals, much yet remains to be done if we would lift the study and treatment of mental diseases to the position it is entitled to occupy in the realm of practical medicine.

I shall now very briefly review the various schemes which deal with cases of early insanity, and adduce arguments in favour of the establishment of—

- (a) Mental wards attached to general hospitals for the treatment of uncertified suspected and mild cases.
- (b) Acute wards at the hospitals for the insane for the treatment of certified acute cases.

In Europe psychiatric clinics are established at the large hospitals of University centres such as Berlin, Munich, Vienna, Genoa, &c. Each clinic consists of wards or pavilions, with out-patient departments. They have, in addition to other essentials, rooms for massage, gymnastics, hydro-therapy, and electro-therapy. These clinics have become justly celebrated, and the results obtained, especially in the direction of clinical teaching and effective treatment, have been very gratifying. Under the reception-house system excellent work is done in observing and treating borderland cases and early cases of acute insanity, and the system adopted varies in different places.

In Victoria patients are admitted on modified certification, and the period of treatment may continue up to two months. After this period such patients as have not been discharged are sent to an acute mental hospital, where they may be treated for a further period prior to discharge or transference to a hospital for the insane.

In New South Wales the reception-house system is conducted on somewhat different lines, inasmuch that after observation for a certain period patients are either discharged or transferred direct to a hospital for the insane, where they are treated for a further period in special acute wards, apart from the chronic insane. Furthermore, in New South Wales some provision is made for the admission of uncertified patients.

In Queensland, Dr. Ellerton, the Inspector of Asylums, has, I understand, suggested to his Government that mental wards be attached to general hospitals for the treatment of early insanity.

In Western Australia the general hospital system was introduced by Dr. Montgomery, the Inspector-General of the Insane, in 1904. Patients suspected of being insane are admitted to a mental ward of the Perth Public Hospital on a justice's order, accompanied by the usual medical certificates. Though this system works well in Western Australia, I would rather make the mode of admission a simpler one, and avoid certification. In South Australia Dr. Cleland has for many years advocated the general hospital mode of dealing with suspected and mild cases of insanity. This proposal did not until recently elicit any expression of sympathy from the Adelaide Hospital Board. Now, however, as this important matter is likely to have some practical issue, it is proposed to open a mental ward at the Adelaide Public Hospital for the reception of uncertified cases of suspected and incipient insanity. It is suggested that all the hospital honorary medical officers, as well as one of the medical officers of the Hospital for the Insane, be placed on the medical staff, and that the nursing be done by hospital-trained nurses. The mode of admission would be somewhat similar to that of the other departments of the hospital, viz., recommendation for treatment by a legally-qualified medical practitioner. Treatment would be continued for any period up to four weeks, to be increased in special cases by weekly periods up to eight weeks.

As a second filter, it is proposed to build a special block in the asylum estate for the reception of certified acute cases. Plans for such a block have been already submitted to the South Australian Government. These receiving wards will be pleasantly situated at some distance from the main buildings, and will consist of male and female divisions, with wide verandahs for purposes of open-air treatment. The dormitories, dining-rooms, lavatories, &c., will be constructed in accordance with modern ideals. In these wards no chronic or incurable cases would be admitted; treatment would be continued for about six months, if necessary, from date of admission, and patients would be admitted either from the public hospital, or direct by certification in the ordinary way.

Such a high authority as Dr. Goodall, of the Cardiff Mental Hospital, is of opinion that, in connection with psychiatric clinics and mental wards in general hospitals, "it is highly important that as few legal formalities as possible be observed in regard to the admission, detention, and discharge of patients."

Even in this enlightened age the certification of insanity often entails undeserved hardship on the patient who, after recovery from an acute attack, seeks to resume his ordinary avocation and his place in the social world. Very fortunately, however, as the result of increased knowledge and a contemptuous disbelief in the causative part that used to be assigned by the superstitious to spirits and devils, insanity is coming to be generally recognised as a disease. Moreover, it is known to possess actiology, pathology, and symptomatology, and to be amenable to medical treatment. For the same reasons the old and familiar cry of "certification stigma" will, in gradual process of time, be relegated to its proper place amongst the other relics of barbaric days. In the meantime, we must face the situation, and in the interests of early and recoverable cases avoid certification where possible.

All kinds of mild mental disorder could be admitted to a general hospital. Thus we could deal with neuroses and psychoses, toxic cases, cases with head traumatism, and all cases dependent upon bodily conditions which need surgical, medical, or some special form of treatment. Especially, in my opinion, should cases of hysteria, neurasthenia, and hypochondriasis, which have so frequently to be sent to mental institutions, be admitted without certification to a general hospital. With regard to cases of alcoholic insanity, if they be mild they might be admitted to the mental ward without certification; but if maniacal or chronic, they should be certified and sent to the hospital for the insane.

It has often been said that alcoholics are not fit to associate with decent, self-respecting people who have become mentally disordered. This is, perhaps, too hard a view to take of the matter, though there is much that may be said in support of it, and there is no doubt in my mind that, for the alcoholic insane, a special and separate block should be constructed in connection with all hospitals for the insane. Under the reception-house system of dealing with incipient insanity, I would like to point out what I consider to be certain disadvantages:—

1. The cases are not as conveniently placed as they would be at a general hospital for the facilitation of consultations with and treatment by gynæcologists and other specialists.
2. The real *raison d'être* of a reception-house is that it should be an institution which, though admittedly dealing with mental disease, has none of the so-called "objectionable" features of a lunatic asylum. While this view of the matter may, and probably does, obtain at the beginning, it is unfortunately only a question of time when a reception-house comes to be regarded as a variety of lunatic asylum.
3. The relatives and friends of a patient are often reluctant to admit the desirability of early certification and institutional treatment. In such instances the patient will lose the benefit that might accrue from prompt and early treatment.
4. A patient suffering from incipient mental disease will naturally, in many instances, offer strenuous objection to any suggestion or plan for his removal to an institution specially set apart for the legal detention and treatment of cases of mental disease.

The arguments I would bring forward in favour of the proposed general hospital scheme are:—

1. With its real hospital environment, and absence of certification, not only would there be little objection on the part of relatives and friends to submit a case to early treatment, but it is readily conceivable that the patient himself could, in the majority of instances, be induced to undergo treatment. In support of this argument, I may mention that very often patients who have been admitted to our institution at Parkside under the impression that they were to have been taken to a "hospital" have bitterly resented their detention in a lunatic asylum, and the deception which was practised upon them.

2. The advantage to the patients, in being so near and so easily accessible to the advice and treatment of specialists in other departments of medicine and surgery is very great. The benefit of such proximity can more readily be gauged when one remembers that such conditions as visceral disease, displacements and disease of the uterus, menstrual disorders, diseases of the skin, eye, ear, nose, and throat, and head traumatism may underlie the mental disorder, and therefore, in the interests of the patient, demand prompt and skilful treatment.
3. The advantages from the point of view of clinical teaching are obvious. Medical students, who must of necessity spend a large amount of their time in the various wards of a general hospital, would have, under this scheme, greater facilities for acquiring a knowledge of the varieties and treatment of early mental disease.
4. The system could eventually be extended to the general hospitals of large country districts, which have to be considered as well as metropolitan centres. These hospitals, which are usually large and well-staffed, could have small mental wards attached to them. In such cases the receiving ward of the nearest hospital for the insane would act as a second filter.
5. If we are to teach that insanity is a disease which, like other diseases, will benefit by hospital treatment, we can surely find no more logical means of demonstrating to the lay mind the truth of such teaching than by the adoption of hospital treatment in the literal acceptance of the term.

Coming now to the important question of a second filter, I believe that a separate block, for the reception and treatment of certified cases of an acute and curable type, attached to the hospital for the insane, will best meet all requirements.

In England, acute blocks have been attached to certain institutions, such as the famous West Riding Asylum at Wakefield and at the new London County Asylum at Long Grove. Here, in New South Wales, Dr. Eric Sinclair is proving the value of the scheme, and it is proposed to inaugurate it in South Australia in the near future.

The advantages of having our acute hospital in the asylum estate, rather than at some distance from it, are that, in the first place, while possessing all the advantages of a separate institution, it is, for administrative and clinical purposes, a ward of the main institution.

This means that the medical and nursing staffs are not necessarily separate and distinct from those of the hospital for the insane. In this way the members of the staff are not induced to allow their knowledge of acute insanity, and of its management and treatment, to undergo, as it were, a process of atrophy because of their continued daily inspection of chronic types.

Secondly, the transference of patients from the acute wards to the main institution, or *vice versâ*, is an easy matter, and need not involve that display of vigilance and officialdom so commonly associated with admissions to an asylum.

Lastly, the annual report on the hospital for the insane, showing the percentage of recoveries on the total admitted, would be comprehensive, and include that of the acute hospital. In those instances where the latter is an independent and isolated institution, the hospital for the insane must of necessity show a large reduction in the percentage of recoveries. This apparent anomaly is, I think, apt to be misunderstood or misinterpreted by the general public, and seems to do injustice to the medical officers of the hospital for the insane.

In conclusion, I would like to point out that 70 per cent. of our recoveries at Parkside undergo treatment for less than six months, and more than a third for less than one month. Many of these cases might have been successfully treated in a general hospital, without having been certified. Moreover, amongst the admissions is always a number of incurable types, such as congenital defect, senile and organic dementia, general paralysis, &c.

Remembering, therefore, that under the system I advocate an endeavour would be made to admit both to first and second filters only early and curable cases, and to eliminate where possible chronic and incurable types, it might reasonably be expected that a large percentage would recover without having been actually in association with the chronic insane, and many without having been certified.

REFERENCE.

"Ideals in Psychiatry," *B.M.J.*, 16th April, 1910.

THE TREATMENT OF MENTAL DISEASE IN THE EARLY STAGE.

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THE topic assigned is the "Treatment of Mental Disease in the Early Stage." Mental disease has been defined as "a prolonged departure from one's natural way of thinking and acting." The definition draws a distinction between mental disease and mental defect, for inherent or congenital conditions are permanent and are the natural state of the individual. Mental degeneration, as a late or secondary stage, and certain specific affections, as general paresis with allied disorders, and those arising from organic nervous disease, are eliminated from discussion.

as constituting a class by themselves, needing special study and treatment. The term Mental Disease, strictly interpreted, is to be applied to the functional disorders arising from an exciting cause in a previously normal individual. Predisposition, if it exist, may never have been manifested in the patient. He is assumed to have been an active member of society, engaged in business, and meeting all domestic and economic responsibilities upon the same terms and under the same conditions as his neighbour. It is his misfortune that under unusual stress he succumbs to a mental affection rather than to fever or diabetes, or some other equally distinct physical disease. The causative factors may be identical, but the effect is sadly disproportionate, for the victim of physical disease enlists the sympathy and the unbounded charity of the community, whereas the mental patient is eventually alienated, excites fear, apprehension, hostility, or aversion, requires special care, and may become an outcast.

It is possible that complex modern life has introduced conditions leading to new manifestations of disease. Whether this be so, or whether closer clinical study has brought to notice certain symptoms and their causes hitherto overlooked, a group of mental cases does exist, acute in character, requiring early and appropriate treatment, for whom restoration of health is to be sought and reasonably expected.

These patients are variously classified by different authorities. The symptoms are characterised by delirium, stupor, mania, melancholia, or confusion. These are not different or distinct diseases, but rather the individual response to functional derangement of the nervous system. The pathological basis is exhaustion complicated by a toxic state, and the comprehensive phrase "exhaustion psychoses" includes the whole group. The primary cause is mental, and this may be almost invariably traced to worry. Worry is "a state of perplexing care," and is more or less enduring.

The abnormal "state" of mind persists and disarranges the function of the nervous system. Sleeplessness and disturbance of digestion follow and are associated with disorder of secretion and excretion. Elimination is imperfect, and the products of metabolism and other substances are retained within the body. Although these vital processes are little understood, analogy warrants the conclusion that harmful or poisonous agents are absorbed and carried by the circulation to work further evil upon nervous and other tissues, already reduced in tone and in capacity for resistance. The toxic element is thus introduced. Though the mental manifestations may be more patent to the unskilled observer, the serious physical disorder is recognised by the trained physician, whose efforts are directed to the restoration of normal function. In many cases symptoms develop gradually and intermittently and may be overlooked; in others the outbreak is sudden and critical, and is attended by delirium and collapse.

The patient is assailed by strange and unexplained fancies; his bodily sensations are perverted and novel; he reacts in an unusual way to external impressions and mistakes the attitude and purposes of his friends; he hears accusing and threatening voices. He is vaguely conscious of the loss of control, and seeks the cause. He fears insanity,

and all the real or imaginary danger implied in this threatening prospect. His apprehensions are augmented by the remonstrances and evasions of those about him, and he becomes suspicious and violent. Frankness or honesty in intercourse, essential at this point, are usually avoided, though the simple explanation to him that his condition is one of associated mental and physical disease calling for appropriate medical treatment with the prospect of ultimate recovery, is eagerly accepted. There is no more impressive fact in the symptomatology of incipient mental disease than this response by the patient to plain-dealing.

This simple psychological truth is in itself a protest against the practice of placing the patient under the jurisdiction of a court of law as preliminary to medical treatment. In entering an objection against this custom, honoured by long observance, it is to be understood that a plea is made for the early and rational treatment of a disease, and that degenerate and defective people, constitutionally unable to conform to the rules of society, as a group or class, are not here considered.

The need of systematic treatment having been established, the question arises as to where this may best be carried out. In the management of severe surgical and medical diseases the physician is autocratic, and his action is prompt and decisive. In no less severe mental cases he is driven to temporise. He is compelled, against his better judgment, to attempt a course of treatment at home. This is usually unsuccessful, and results in excessive drugging. The reason for this is not always medical, and an added pathological condition complicates the case and augments the symptoms. The family is sympathetic and anxious to the point of sacrifice, but unskilled and apprehensive. The home is not readily converted into a hospital, nor does the patient submit to discipline in an environment in which his desires, opinions, and habits have been unquestioned. In the hospital he responds unconsciously to routine, and to the dictation and advice of others whose relations are established upon the accepted basis of technical skill. Mental patients are proper cases for the hospital, requiring no less definite and rigid rules of treatment than those applied in the practice of surgery. The analogy between exhaustion psychoses and general medical and surgical diseases cannot be urged too strongly. There is no real distinction. Both present morbid physical conditions to be relieved by treatment, for surgical and other so-called physical diseases are frequently complicated by outspoken and severe mental symptoms. The same generous provision may be made for mental cases as for surgical, and all acute diseases may be treated in the same hospital. In undertaking work of this broad scope, the hospital may provide separate buildings adapted to the requirements of different classes of patients.

In 1902 a building for incipient mental cases was annexed to the group constituting the Albany Hospital. As attending physician I have had the duty of preparing annual reports. These reports have attracted the attention of your Secretary, Dr. Davidson, and to this I am indebted for the honour of the invitation to address your Congress. That the work of this modest institution should have had notice at the other side of the world has been as gratifying as it has been surprising to those who have had it in charge. As a departure, and without precedents,

in the United States at least, it has met difficulties. The ordeals of organisation and administration have some degree of compensation in the attention attracted and the compliment conveyed in your invitation.

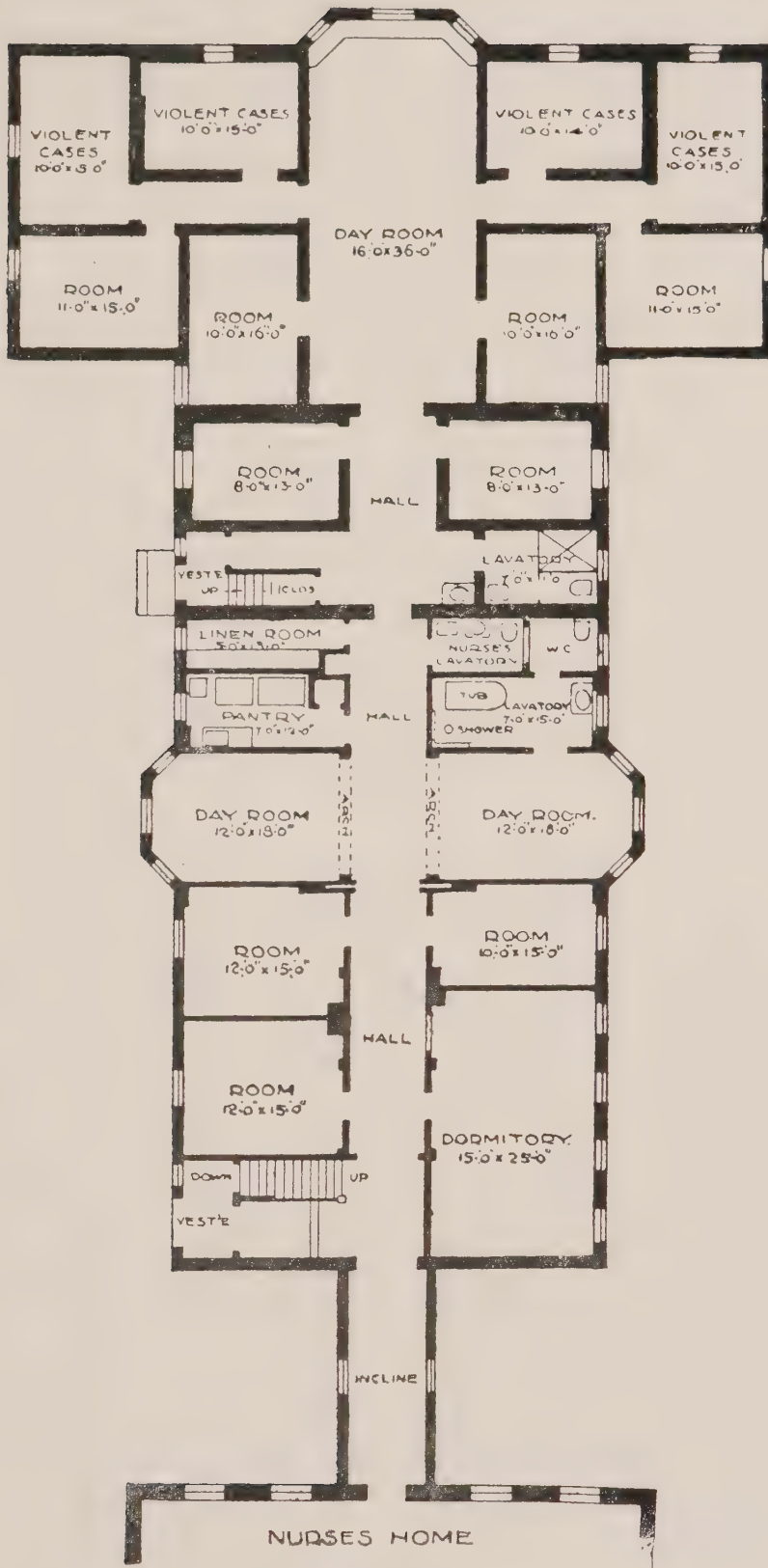
The purpose of this department of the hospital is the reception without legal process of incipient mental cases for observation and treatment and determination of the advisability of commitment to institutions for the insane. In the nine years of existence two thousand patients have been admitted, of whom over one thousand have been restored to their homes and occupations.

The building is of two stories, each divided into two sections or wards for classification. There are thirty-one beds; the capacity of the hospital is 360 beds. Access for service is through the basement, otherwise the building is separated from the main corridor or group of pavilions, with private entrance for patients and visitors. This serves the double purpose of preventing annoyance of either class of patients by the other, and of protection of the mental cases from the scrutiny of incidental visitors. There is a small associated dormitory of four beds on each floor; all other accommodations are in single rooms.

The income of the hospital is derived from private patients and from public patients who are received upon the order of a public officer charged with the care of the poor, partial cost of maintenance being paid from the public funds on a *per capita* basis. The hospital has a moderate endowment.

The administration of the pavilion for mental cases is part of that of the hospital. The staff consists of a resident medical superintendent and internes; the care of patients is under the direction of the attending physician, whose recommendation decides admission, discharge and treatment. Many delicate questions arise, and the success of the pavilion has been promoted by the cordial co-operation of the superintendent, the commissioner at the head of the city department of charities, and the attending physician. The hospital maintains a highly efficient training school for nurses. Pupil nurses are required to pass at least ten weeks in training in the mental wards under the direction of a permanent head nurse who has specialised in this department of nursing. The nurses on duty in the ward for men are assisted by male orderlies.

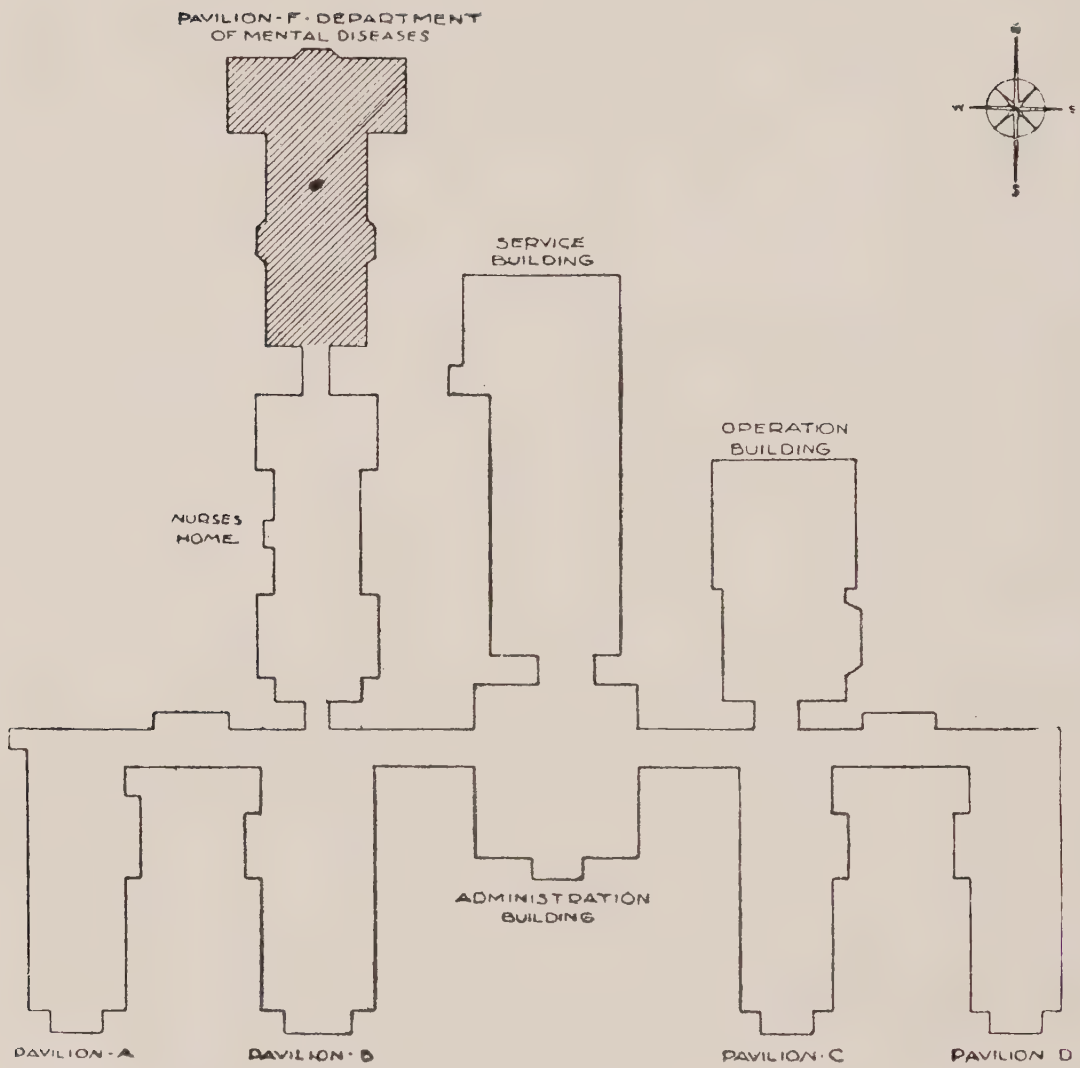
Patients are received upon their own request or upon that of friends when they do not object. Dr. Goodwin, superintendent of the hospital, states that after a frank presentation of the case, practically no patients decline to remain for treatment. No patient is detained who demands release or declines to co-operate with the treatment. If he be harmless, he is permitted to leave at any moment. If there be doubt as to his personal responsibility, the friends or public authorities are notified, and they remove the patient or begin legal proceedings for commitment to an institution for the insane. The moral status of the hospital is assured; its board of governors are representative men of the community, and it is subject to inspection and the laws of the State regulating general hospitals. Without public confidence an undertaking of this kind could not be sustained, and there has been no private or public complaint of the service rendered, or of improper detention or disregard of the civil rights of patients.



FIRST AND SECOND FLOOR PLANS
PAVILION "F", DEPARTMENT OF MENTAL DISEASES
ALBANY HOSPITAL
ALBANY, N.Y.

A. W. FULLER, ARCHITECT

W. B. PITCHER, ALBANY N.Y.,



BLOCK PLAN OF ALBANY HOSPITAL
ALBANY, N. Y.

A. W. FULLER - ARCHITECTS
W. B. PITCHER - ALBANY, N. Y.

The principle of treatment is physical and mental rest. Patients are usually placed in bed and measures adopted for the correction of physical functions. An initial dose of calomel is followed by a saline, and diet is limited, and at first is largely, if not entirely, liquid. Warm baths and warm drinks are used at bed time. In extreme cases of prostration and delirium, a nurse is assigned to the patient and instructed to apply the routine of fever nursing, 6 oz., respectively, of water, broth, and milk, to be given at hourly intervals. The medicines preferred are strychnine, iron, digitalis, nitroglycerin, ergot, valerian, asafoetida, cascara-sagrada, and aloes. Hypnotic drugs are not used, except in rare instances, on the prescription of the attending physician, and as routine are prohibited. Enemata or subcutaneous injections of normal saline solution are occasionally of value. Hourly notes are made by the nurse at the bedside, and the duration of sleep, weight, and temperature, when advisable, charted. The excretions are watched, and the urine and dejecta frequently scrutinised. As these improve, the tongue clears, the skin becomes moist, sleep increases, and the paroxysms of excitement become less frequent and shorter. In a few weeks the patient enters convalescence or the anticipatory state of hebetude. Tonics, liberal feeding, diversion, and recreation are then provided.

The mental aspect of the case is no less rigorously analysed. Removal from home is indicated and required by the lack of facilities at the home, and of training of the family. But a degree of mental shock may attend this step. Interruption of all intercourse with family and friends is a hardship which has often operated to the prejudice of patients sent a long distance to institutions for the insane. The presence for the first few days of someone acquainted with the temperament and habits of the patient relieves apprehension, and active treatment may be wisely delayed until confidence is established.

The nurses are taught by lectures and by bed-side observation to regard the abnormal mental manifestations, delusions, and hallucinations, impulses and other vagaries, as automatic and beyond the volition of the patient, conditions that are not subject to argument or correction. The attitude of the nurse is that she is caring for a person who is sick, and every ministration is based upon this sympathetic assumption. Coercive measures are seldom needed, and are prohibited except upon the direction of the physician, and this is not given unless critical exhaustion threatens. Emphasis is laid upon the fact that abnormal nervous action is paroxysmal, varying from hour to hour. Nurses observe this, and administer food and medicine in the quieter intervals, and avoid interference with the paroxysm. In fine the purpose is to stimulate whatever normal function remains and to cultivate co-operation and goodwill, as well as to promote a return of the physical functions to a normal condition.

Many patients are discharged "improved." It is not always necessary or advisable that complete restoration of health be awaited. After acute symptoms have subsided and convalescence is promised, the environment of a hospital is depressing. Fading recollection of unpleasant acts and suffering is to be encouraged by change of scene, and restoration of natural conditions is helpful. Fear of further or permanent mental impairment is a detriment to recovery, often dissipated by return to the home. The

family and patient have learned the cause of the attack and how to prevent recurrence. Acute cases of mental disorder follow a long departure from normal physical health, and the active symptoms are an incident in a protracted course of neurasthenia. The duty of the hospital is the removal of this complication and the education of the patient in its causes, its cure, and its prevention. It is particularly to be enjoined that all harmful therapeutic methods, especially the induction of stupor, miscalled sleep, by narcotic drugs, should be avoided.

Mental medicine is grounded in tradition as old as the human race, and as fanciful as the superstitions of ages may suggest. The dismayed friends of its victim seek some explanation of the "alien" processes of thought other than that of insanity, which, for them, is a mysterious dispensation and not a violation of natural law.

Expedient measures are adopted in the vague hope of some turn of fortune to stay the evil course of events. The physician acquiesces, under protest, in remedial attempts, until, of necessity, the patient is pronounced "insane." It may be suggested that the nomenclature be recast. If "insanity" be the term to describe the state of a permanently wrecked individual, an offender against the order of the community, then the victims of transient mental disorder occurring in the course of physical disease, ought not to be so designated. For them medical, not legal, treatment is required. This treatment should be prompt, systematic, and effective. Three-fourths should recover health.

The equipment and purposes of modern hospitals for the insane are increasingly adapted to this need, but these institutions are often remote and secluded. In incipient stages of mental disorder some more general and readily available provision is needed. The experience at Albany shows that a general city hospital may successfully meet this want and may properly acquiesce in this broader conception of duty. The general hospital may receive and treat cases of mental disorder in the early stage, just as it may receive patients delirious or unconscious from accident or fever, but should not attempt to provide for those suffering from terminal stages, or organic disease, who are subjects rather for custodial care.

CONTRIBUTION TO THE DISCUSSION ON THE EARLY TREATMENT OF PATIENTS WITH MENTAL DISEASE.

By ERIC SINCLAIR, M.D. (Glas.).

Inspector-General for the Insane, N.S.W.

THE majority of patients entering the hospitals for the insane in this State do so through intermediate institutions—the Reception House, Darlinghurst, and the Reception House, Newcastle. The total number of admissions to the hospitals last year was 1,221, and of these 720, or 59 per cent., passed through these institutions. The total number of cases, however, treated in these reception houses was 1,289, and of this number 55·8 per cent. were certified, while the remaining 44·2 per cent. were, through their instrumentality, saved the stigma of having been inmates of a hospital for the insane, or of having been placed in a police cell. These are the only two

reception houses so far established in New South Wales as separate institutions, and serve the Sydney and Newcastle districts respectively, while patients in the country are, in most cases, sent to the lock-up and placed under the care of the police. In July, 1905, rooms in the gaols of twelve of the larger country towns were gazetted reception houses under section 52 of the Lunacy Act, in each of which two cells were set apart for insane patients. The patients are not in these cases regarded as ordinary prisoners, and their names are not recorded in the gaol books. They are under the care of the visiting surgeon or Government medical officer, who, after observation, certifies and sends them on to a hospital for the insane, or discharges them, as the case requires. The nursing in such cases is provided at the expense of the Lunacy Department.

The practice, however, has not proved to be of much advantage in relieving the feelings of the patient or his friends, as the fact of the room gazetted as a reception house being in the same building as and part of the gaol associates them in their minds, and in spite of the fact that their names are recorded differently they feel their position as keenly as before, and consider themselves little better than prisoners. The advantage, therefore, of admission to a reception house and avoidance of stigma which obtains in Sydney and Newcastle districts does not accrue in the country in the cases of these gazetted reception-houses.

The total number admitted to all gaols during 1910 was 308, and of this number 94, or 30·5 per cent. only, were certified and sent on to a hospital for the insane. The remaining 214 were discharged; but to them still clings the stigma of having once been confinees of a police cell. Of the 308, 113 were admitted to the reception-houses established in country gaols referred to above, and of the ninety-four certified patients forty-two were sent on through these institutions.

Section 7 of the Lunacy Act does not allow a patient to enter a reception-house who has once been convicted of an offence, a provision necessary in order that chronic police court inebriates may not monopolise the accommodation of the reception-house.

A certain number of cases will, therefore, continue to be dealt with in the gaols, even though other accommodation is provided.

It will be seen that of the 1,221 admitted to the hospitals for the insane ninety-four only came through gaols or lock-ups, and that of the 1,597 who were under observation in reception-houses and gaols 308 were in the gaols, while 1,289 were in the reception-houses at Sydney and Newcastle. In other words, of the total admissions to the hospitals for the insane but 7·7 per cent. passed through the gaols, but of those placed in these preliminary institutions for observation 23·8 per cent. passed through gaols. Again, of the 308 who were admitted to the gaols, 110 were in Darlinghurst Gaol, and the balance (198) were distributed throughout the whole of the State. Gaols in twenty-eight towns each admitted a certain number, and of these gaols one admitted twenty-eight during the year, one twenty-one, one eighteen, one thirteen, one twelve, and the others numbers from nine down to one.

These figures are given to explain what might appear to be dilatoriness on the part of the Lunacy Department as to a subject which admittedly presses for reform. The reason is the small numbers to be benefited as compared to the very large cost to be incurred. If the patients were more concentrated, reception-houses in the larger towns would have been arranged for, as in Sydney and Newcastle. It is, however, recognised that the time has arrived when some further steps should be taken, even though increased expenditure may be involved, and it is hoped that the information gained during this debate will help to point out the most useful and most desirable path to follow. The present indication is to make use of the local general hospitals in the country towns, with or without additions specially provided for mental patients, and for the Lunacy Department to undertake the cost of maintenance in these hospitals, and to provide specially trained nurses or subsidise suitable local nurses.

For many years an escort has been provided in the shape of nurses from the Reception House, Darlinghurst, to accompany female patients from the country, and possibly the time has arrived for extending this, and to make the Lunacy Department responsible for the complete escort of all patients in transit to hospitals for the insane. One of the difficulties of doing so is the delay which would be involved, as the patient would have to wait until an attendant or nurse arrived from Sydney to the part of the country where the service was required.

It should also be pointed out that for many years the Department has provided that patients passing through the reception-house are not taken to the ordinary police court, and so avoid being exposed to public gaze, or have their cases reported by the press.

An experimental contribution to the treatment of patients before certification has been made by providing a ward for such cases at Darlinghurst in the grounds adjoining the reception-house. The ward has accommodation for twenty male patients, and has been in operation since May, 1908. It is managed as far as possible on the lines of a general hospital. The patients are admitted without certification of any kind, and are in the fullest sense voluntary. Although the results of the treatment have been satisfactory, the institution appears to demonstrate that the proportion of patients suitable for treatment without legal restraint is comparatively small, as the ward capacity has not yet been overtaxed.

The experiment indicates, though it does not prove, that a hospital for mental diseases must have the power of detaining patients. On the other hand, if this is granted there may be a danger that in the course of time a stigma will attach to patients who have been treated in such a hospital equally with those who have been in the regular hospitals for the insane.

SUMMARY OF OPINIONS OF GENERAL PRACTITIONERS ON EARLY TREATMENT OF MENTAL CASES.

Read by ERIC SINCLAIR, M.D. (Glas.), Sydney.

WHILE the arrangements for this discussion were before the Committee of the Section, it was suggested that it would be of value to obtain the experience of medical men in general practice in regard to the treatment of mental cases before they had arrived at the stage requiring certification. It was pointed out that the officers connected with the hospitals for the insane and consultants in mental diseases rarely see a patient until the disease has become more or less confirmed, and that the general practitioner alone has the opportunity of observing and treating the earliest stages.

The suggestion seemed so valuable that it was adopted, and a series of questions were drawn up in the form of a circular and forwarded to some 500 or 600 of the medical profession. It is regretted that eighty-two replies only were received, but in these instances a considerable amount of care and thought had been expended on the information supplied. We desire, therefore, to express thanks for the amount of trouble taken by these gentlemen in furnishing the information.

The questions circulated were as follow:—

1. What course is generally adopted for the care of a patient who is not yet certifiable?
2. Presuming certain cases will recover without being sent to a gaol or a hospital for the insane, what facilities would you suggest as necessary for their treatment?
3. When a patient exhibits symptoms sufficiently acute for certification, what steps are now taken to have him sent to a hospital for the insane? Could you suggest any improvement in the present method of dealing with such cases?
4. Do friends of patients object to handing them over to the police? Is proper treatment likely to be delayed on this account; and, if so, what other means of dealing with such cases would you suggest?
5. Do the present arrangements give the impression that insane patients are treated more like criminals than persons suffering from disease, and is such an impression present with the patient or his friends?
6. In your opinion, would it be desirable to treat incipient mental cases in general hospitals?

The suggestions received were many and various, and there has accordingly been a difficulty in preparing a summary sufficiently short to be laid before you in the time at our disposal.

Treatment at home in the early stages, it was generally agreed, is unsatisfactory; but no very practical suggestions for remedying

the defect were made.) The majority appeared to think that as soon as it is recognised that the case is a mental one the patient should be placed under special treatment either in a special hospital, a reception-house, or in special wards to be added to local general hospitals. As to staff of these hospitals, it was suggested that the Government should supply nurses either from the hospitals for the insane or from a central dépôt to be established for the purpose, from which these special wards could draw their staff. A few suggested the Government providing trained mental nurses in the patient's own home for a moderate fee, much as in the bush nursing scheme.

The rest of the information given in the replies applied only to patients whose mental condition was fully recognised, and who had probably arrived at the stage of being certifiable. It is obvious, therefore, that the point aimed at in the present discussion is not fully appreciated by the general practitioners, but that they recommend treating even the early stages of mental disease in exactly the same manner as the more pronounced.

In regard to treatment of patients after they have become certifiable, it was generally agreed that the effect of placing the patient in the hands of the police for conveyance to a hospital for the insane or local gaol or lock-up, for temporary treatment, either to determine the patient's insanity, or before removal to a hospital, had a detrimental effect on the case. The patient and friends were said to resent the patient being classed with offenders, and delays in obtaining suitable treatment because of this were frequent and harmful. The remedies suggested were, generally, those already mentioned as applicable to the early stages, the most general being the proposal for providing a staff of nurses or attendants trained in the hospitals for the insane, and the erection of suitable hospitals, or wards attached to general hospitals. It is, however, noticeable that by far the greater number of general practitioners objected to the patients being admitted to the local general hospital, as it now exists. Statements were made that such a course would be unfair to the medical and nursing staffs, and would interfere with the well-being of the ordinary patients. It was generally recommended that special hospitals should be established instead of adding wards to a general hospital, although it was, in a few cases, suggested that this might be confined to the large centres of population. It is difficult to ascertain if the reporting practitioners intended the cases to be treated in these wards to their termination, or if they proposed them for observation pending an opportunity for the patient to be forwarded to a hospital for the insane. The impression left is that what the majority intended was the latter.

The need for longer observation on the part of the medical practitioner was pointed out, and it was suggested that they should be allowed to make repeated examinations. It is obvious that this is contradictory of other opinions, which advise that patients should be sent to a hospital for the insane or special hospital as soon as possible.

It was also suggested that a medical man, by notifying the proper authorities, should be able to have the case sent to the reception-house when the relatives object to take him there themselves.

With regard to the certification and forwarding of patients to a hospital for the insane, it was suggested that the open court procedure might be replaced by the magistrate attending at the patient's residence, or by the provision of a special lunacy court on the lines of the Children's Court, not open to the public or the press. It was also recommended that special escort to the hospitals for the insane should be provided by ambulance corps or attendants in place of the police.

More than one gentleman emphasised the opinion that the average nurse is of little value in dealing with mental cases, and urged that specially trained nurses should be made available.

It should, perhaps, be pointed out that opinions are about equally divided as to the harmfulness of the present methods, namely, handing patients over to the police, and treating them in local gaols and lock-ups. As many thought no harm resulted from this as objected to it.

As a general summary it may be stated that it has been brought out that general practitioners who deal with the mental cases in the early stages are not prepared to recommend that they should be treated as cases of ordinary illness, either in the patient's home or in the local general hospital; in fact, their being admitted to the general wards is resented. It is desired that the cases should be treated as special ones, that special hospitals or reception-houses should be provided, that specially trained mental nurses should be made available, and trained escort for conveyance should be provided. Where the local hospital is mentioned the replies are emphatic that special wards should be added to it before patients are received, and even here it is stated that mentally trained nurses should be supplied. At the same time it is asked that all this should be done at the Government expense.

There is also an indication of a desire to make it easier to admit patients for care and observation in the early stages without the formality of fully-signed certificates.

DISCUSSION.

After the reading of Dr. Sinclair's paper, the question of the "Early Treatment of Cases of Mental Disorder," as described in the previous papers, was discussed by Dr. A. W. CAMPBELL (Sydney), the Hon. Dr. BUTLER (Hobart), Drs. MILES and McQUALL (Sydney), and the PRESIDENT.

USE OF THYROID EXTRACT IN THE TREATMENT OF MENTAL DISEASES.

ANDREW DAVIDSON, M.D. (Aber.), and H. HUFF JOHNSTON, M.B. (Syd.).

IN the year 1896 the use of animal extracts was brought into great prominence for the treatment of mental and nervous diseases. A lively discussion took place at the annual meeting of the British Medical Association of that year, Drs. Robertson, Farquahson, Bruce, Clouston, and others taking part. Previous to this (1889) Brown Séquard brought forward his rather startling but never substantiated results from the use of an extract obtained from the testicles of young animals to show how cases of general prostration and of neurasthenia improved, and how old men seemed to become young. Our investigators tried to obtain brilliant results from the use of extracts from the thymus and pituitary glands, but failed to.

Dr. Lewis Bruce was the first (1892) to bring thyroid treatment into practical use, and for a time had several followers, who spoke highly of the results obtained. Since then the matter seems to have dropped out of account, and is seldom referred to. One of us (A.D.) tried this in 1896 in a stationary case of puerperal mania, but with no good result. However, in New South Wales the mode of treatment was adopted in 1896, and since then has been continued, every now and again with brilliant results.

Physiology of Thyroid.

The thyroid and parathyroid are ductless glands, but the complete action of the secretion formed by them is still in doubt. If parathyroids are removed in an animal, death, accompanied by convulsions, quickly takes place; while if the thyroid is removed there is a slow progressive malnutrition, with symptoms akin to those of myxœdema. It is stated that the glands elaborate a special secretion, characterised by the presence of iodine, and it is suggested that this secretion exercises a strong control over the processes of nutrition of the body, more especially the nervous system. Bruce states that the duration of physiological activity is different in the two sexes; in men it is in full activity at adolescence, and then atrophies, while in women it is fully developed when menstruation is established, and remains active till menopause takes place. Other observers, however, do not agree with this statement, and are of opinion that in both sexes atrophy does not take place till after 50.

The discovery of the relationship of the change in the thyroid glands to the disease myxœdema suggested treatment by the thyroid glands of the sheep, at first given raw, and subsequently supplied in tabloids, the process now adopted. The treatment of myxœdema and cretinism thus became a brilliant therapeutic success. It was while giving thyroid to a case of myxœdema that the idea occurred to Dr. Lewis Bruce to administer thyroid to mental cases, on account of the rise of temperature which occurs. He hoped that from the rise of temperature thus artificially pro-

duced an improved mental condition might arise, such as occasionally occurs when a mentally-afflicted person is suffering from a serious bodily disease, such as pneumonia.

Method of Administration.

Dr. Bruce began treatment in 1892 by giving 45 to 60 grains of thyroid daily for some seven or eight days, the temperature rising on the second or third day, and the mental improvement occurring about this time or at the end of the first week. Since then the method of administering the drug has been altered, and the practice now more generally adopted in New South Wales is for the treatment to begin with doses of 15 grains on the first day, this being increased every second or third day by 5 grains, until such time as the patient's condition shows indications of improvement, or becomes fraught with danger, as much as 80 grains a day being given in some cases. The treatment by this means is a much more prolonged one, the drug being administered for at least four weeks; the temperature is seldom raised, but in other respects the same clinical symptoms are obtained by both methods. In some patients where benefit has not been obtained from one course of treatment, a second or even a third is administered, and good results may arise.

Symptoms Noted during Treatment.

In almost all cases thus treated the pulse becomes gradually more rapid (80 to 160), irregular, and feeble, and in some cases markedly different at the two wrists. When the quantity of the drug is at its maximum there is an impending danger of fainting and collapse. There is loss of appetite, sometimes accompanied by nausea and vomiting; increased moisture of the skin; and in every case a well-marked loss of weight, generally from 16 to 24 lb. in the course of four weeks. Some patients, on account of their bodily condition, have been noted as most unsuitable for treatment, such as those suffering from phthisis, well-marked heart disease, and diseased blood-vessels.

Changes in the mental state occur in nearly every case; patients previously dull become bright and talkative; while some, on the other hand, become acutely excited, this applying mostly to those who had been maniacal in the early stage of their illness.

Care in Nursing during Treatment.

It is necessary that the patient should be in bed a few days before the treatment begins, and kept there for some time after the administration of the drug ceases, the date of getting up being decided by the condition of the circulatory system. The weight should be taken every week; pulse, respiration, temperature, &c., must be carefully charted; and it is well that, if possible, the same individual should take the pulse-rate all through the time of treatment. When administration is at its maximum, the patient should not be allowed to get off his back, and must therefore use a bedpan. Diet is by some given without restriction, while others lay great stress on a purin-free diet.

Metabolic Changes.

The metabolic changes have been gone into by one of us (H.H.J.), and the tables which follow show the results of these investigations.

These patients were, for one or two weeks before treatment started, kept in bed in the hospital ward, and their mental and physical condition carefully determined, special search being made for any sign of tubercle or other incipient organic trouble and preliminary examination of blood, urine, &c., made.

On going to bed they were placed on a regular hospital diet (purin free), to which they had to adhere during their sojourn in the hospital ward. They were seen daily, and full clinical observations made weekly.

The following summary shows the results of analysis of eleven cases :—

Blood pressure.—This was taken in all cases with a Riva Rocci mercury sphygmomanometer. An increase of blood pressure was recorded in every case, the highest reading usually occurring about three weeks after the drug is administered. As a rule a slight drop occurred before the completion of the Thyroid course, and in only one case did the blood pressure rise after the drug had been discontinued.

Pulse.—The rate invariably became accelerated in a corresponding ratio to the increasing dose of extract, the resumption of the normal occurring more or less precipitately after the sudden stoppage of the medicament. Most of the cases acquire a pulse rate of 130, the highest in our series being 155. A young patient at Callan Park attained a pulse rate of 196, but this was of fair quality, and she subsequently made an excellent recovery.

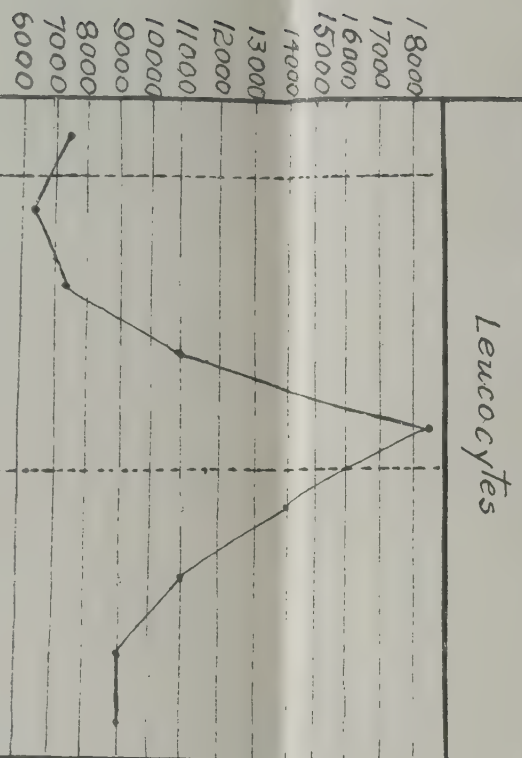
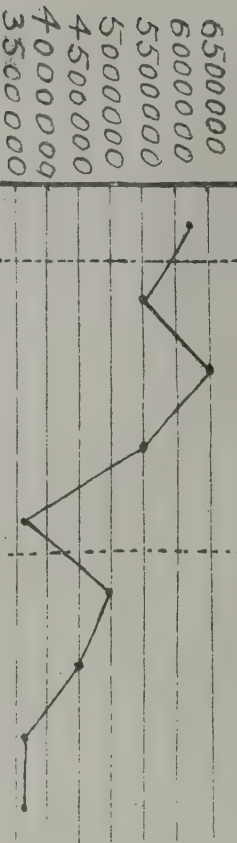
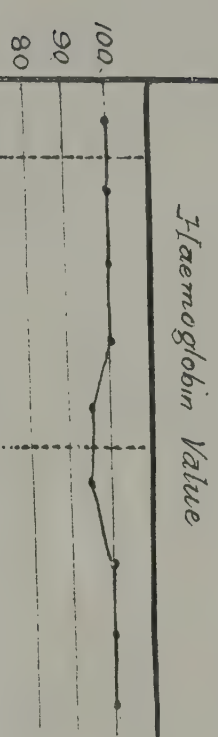
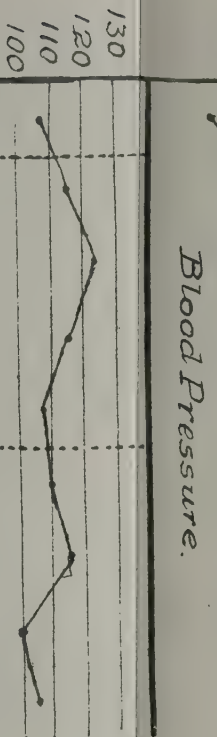
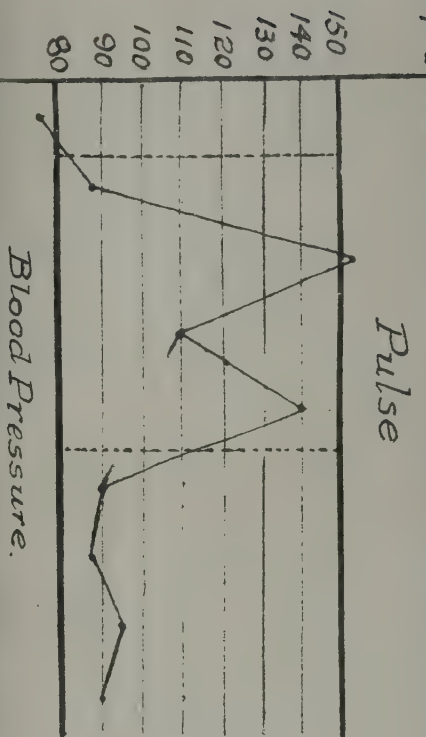
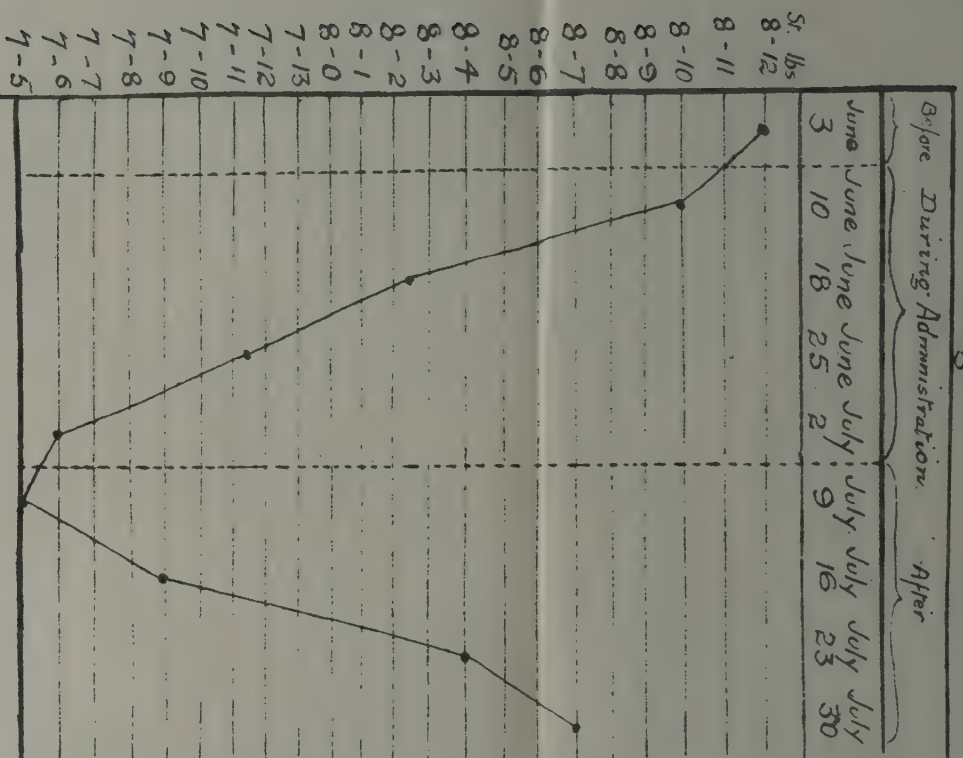
Blood.—The hæmoglobin value varied but slightly in all these cases, in several instances a slight diminution occurred just before, or about the time of the discontinuance of the extract.

The red cells showed considerable variation during the course, most of the cases showed an initial decrease after the commencement of treatment for one or two weeks, and this was, as a rule, followed by an increase of from 1,000,000 to 2,000,000 cells during the next fortnight, after which there was again a tendency for the number to drop through about the same amount. Four of these cases showed a further rise after cessation of administration. The highest cell count noted was 7,400,000, and this before treatment. In this case the count descended in two weeks to 4,000,000, and then gradually ascended during four weeks to 6,700,000. No change in the size, shape, or colour of the erythrocytes could be found.

Leucocytes.—An increase occurred without exception, at one time or another during the observations, in some of the cases the increase was considerable, the count swelling from 9,000 to 20,000.

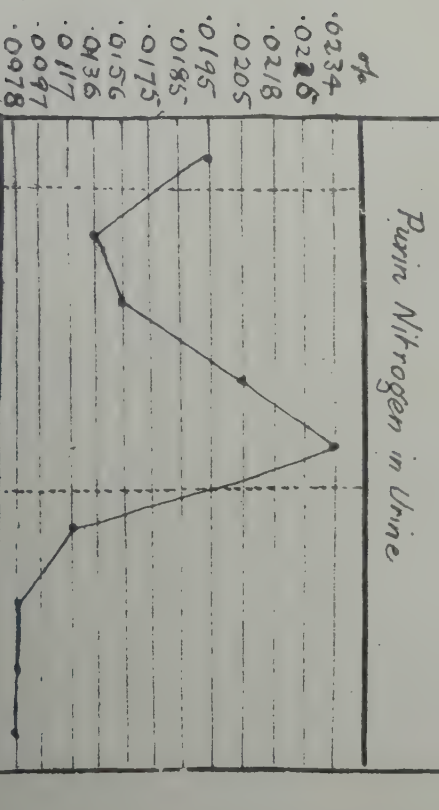
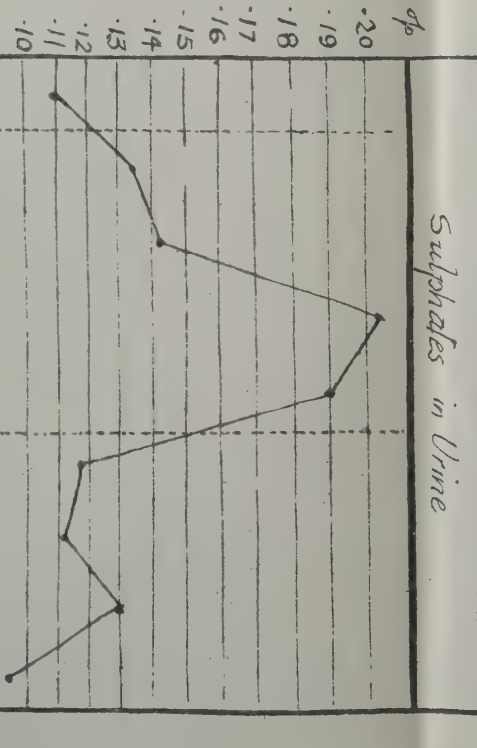
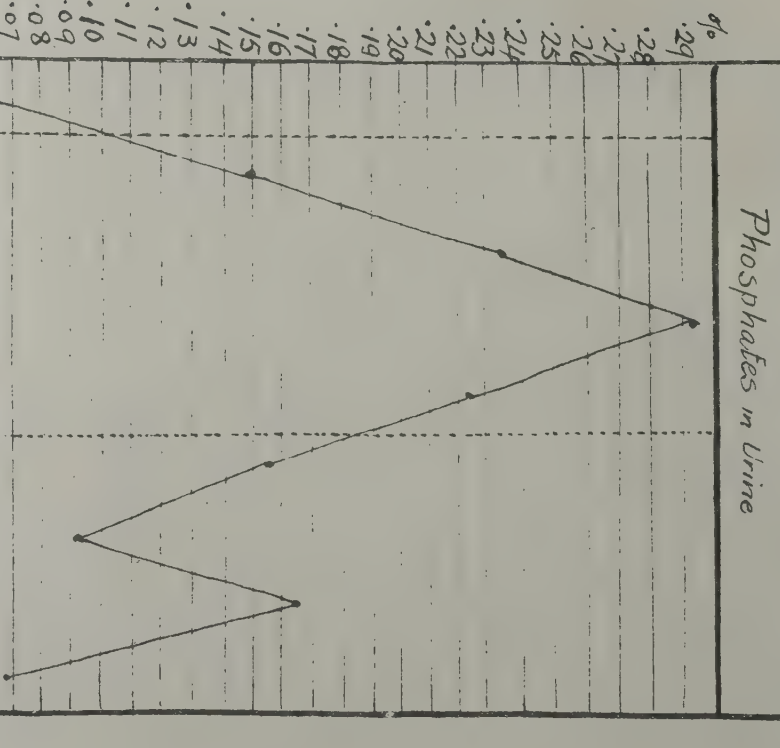
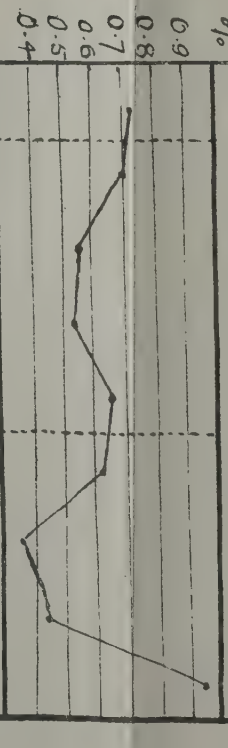
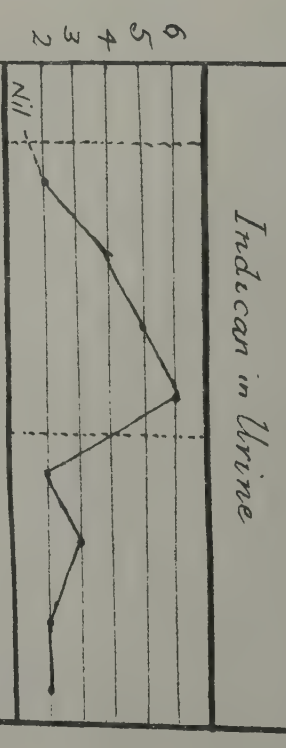
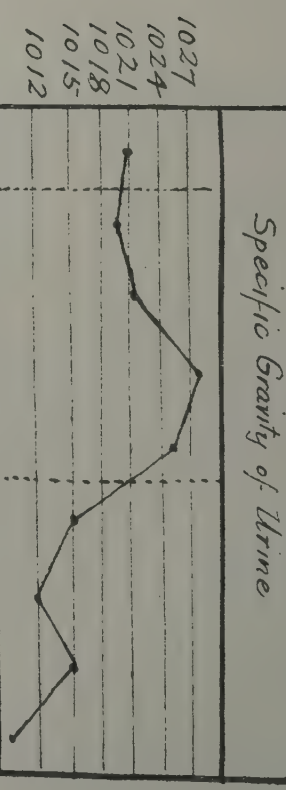
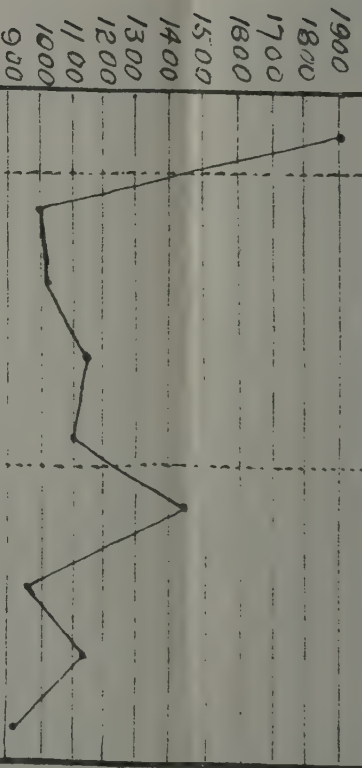
Their variation had no correspondence with that of the red blood corpuscles, rather does a comparison of the graphs show opposite tendencies at the same time. The leucocyte count for several weeks after commencement of the Thyroid administration slightly diminished, and then a progressive leucocytosis set in either just before, at, or soon after the completion of the course. A leucocyte increase occurred after every case in our series but one.

Weight



Differential Leucocyte Count													
Polymorphs	Eosinophils	Basophils	Large Lymphocytes	Small Lymphocytes	68	70	81	70	72	70	70	68	57
1	1	-	-	-	1	1	2	1	2	1	2	1	2
3	4	1	3	4	1	4	2	2	6	6	6	6	6
28	25	18	27	23	28	24	29	35	35	35	35	35	35

Urine in 24 hours in cc.													
June 3	June 10	June 18	June 25	June 2	June 9	June 16	June 23	June 30	June 30	June 30	June 30	June 30	June 30
1900	1800	1700	1600	1500	1400	1300	1200	1100	1000	900	800	700	600



Name A - TT -

Present Disease Primary Dementia.

Age 26 M. or S. Single Religion Presbyterian.

Admitted: - 26. ^{xxx} VIII. '08. Reg. No. 8206.

[illegible]

Weight		
Date.	Stone	lbs.
7. \overline{XII} 08	8	7
14. \overline{XII} 08	8.	$6\frac{1}{2}$
21. \overline{XII} 08	8	1
28. \overline{XI} 08	8.	1.
4. \overline{I} 09	8	2
10. \overline{I} 09	7	12.

The differential count of the leucocytes showed that it was the polymorphonuclear variety which preponderated in these increases. No pathological types were encountered.

Urine.—The total amount passed per twenty-four hours varied greatly, for instance the amount from one patient was 450 c.c. one week, and 1,900 c.c. the next. The majority of our cases showed an increase in total excretion during treatment.

The specific gravity increased in every case but one during treatment, and tended to resume its level shortly after the exhibition of the extract ceased.

Indican was present in considerable amount in all cases, but its relation to the increasing dosage was by no means constant, in some cases the amount increased with the dosage, in others the opposite was the case.

Purin nitrogen showed a well-marked progressive increase throughout the course, followed as a rule by a diminution after the Thyroid extract was withheld.

Chlorides.—The quantitative estimation showed in most instances a decrease in the chloride content during the first few weeks, followed by an increase after withdrawal of the tabloids of the gland, though in some cases the highest estimation preceded the stoppage of the drug.

Phosphates showed a great and characteristic increase during the exhibition of the extract, culminating just before or after its suspension. In some of our cases this increase amounted to as much as .2 per cent. or more, *i.e.*, from .07 to .29 per cent.

Sulphates increased from the outset, but not so uniformly as the phosphates, and were subject to unaccountable fluctuations. The percentage present dropped at once when the drug was discontinued.

We do not know to what extent the products of nervous tissue activity are represented in the blood and urine, though it is but reasonable to assume that such do exist. No effective method has been devised, however, to estimate the products of that activity. Halliburton and Mott have demonstrated the products of gross nervous degeneration such as occurs in general paralysis of the insane in the nucleo-proteid and cholin thrown into the cerebro-spinal fluid and blood, but we have yet to find a means of gauging the activity, either normal or exaggerated, of the mental and nervous processes by quantitative, or even qualitative chemical analysis.

The diagram facing this page is a specimen of those kept in all the above cases, and sets out, perhaps, more clearly the metabolic changes which occurred during and after exhibition of the drug.

Types of cases in which it is used.

The original observers used this extract in cases of stupor, of mania and melancholia that were passing into dementia, and of puerperal, lactational, and climacteric insanity. In Callan Park, during the past seven or eight years, a great many cases have been treated in this way. Notes of 153 cases—76 men and 77 women—have been collected at

random. The forms of mental disease (on admission) amongst these were made up as follows :—

					Recovered.		Not improved.	
					M.	F.	M.	F.
Mania, acute	...	...	...	...	...	3	...	5
Mania, delusional	...	...	...	...	6	1	11	4
Melancholia, delusional	...	...	...	...	...	7	12	11
Melancholia and stupor	...	...	...	...	2	11	...	1
Melancholia, puerperal	...	...	...	...	...	4	...	2
Mania, puerperal	...	...	...	...	...	...	...	5
Dementia, primary	...	...	...	...	12	13	31	10
Congenital mental deficiency	...	...	...	...	...	...	2	...
Total	...	...	...	...	20	39	56	38

The ages are shown as follows :—

					Recovered.		Not improved.	
					M.	F.	M.	F.
15 to 20	...	...	...	...	5	10	16	2
21 to 25	...	...	...	...	10	9	19	14
26 to 30	...	...	...	...	3	6	10	8
31 to 35	...	...	...	...	1	5	5	4
36 to 40	...	...	...	...	...	3	2	5
41 to 45	...	...	...	...	1	2	2	1
46 to 50	...	...	...	...	...	3	...	4
51 to 55	...	...	...	...	...	1	2	...
Totals	...	...	...	...	20	39	56	38

It will be seen from these tables that recovery is most likely to occur in cases of primary dementia and melancholia with stupor, and that in the latter class female patients do well. In regard to age it was found that the best results were obtained between 15 and 25. It may be pointed out that no patient was treated with thyroid until he or she had been treated by ordinary methods, and had passed into a stationary condition with a bad prospect for the future looming.

Results.

Of these 153 cases, 20 men and 35 women recovered. The onset of improvement in these cases varied. In some improvement occurs with remarkable suddenness, so that a case of stupor of months' duration may, a day or two after the administration of thyroid has been suddenly stopped, begin to speak and take notice of surroundings, &c. On the other hand, no noticeable improvement may take place while the drug is being administered, nor at the time when it is discontinued, but with the return of weight and generally improved health (which always follows the cessation of the administration of the drug), a mental improvement may occur even six weeks or two months later.

One of two things occurs (*a*) a crisis is produced from the sudden cessation of the drug which has been producing marked excitation of the nervous system and complete change in general metabolism, or (*b*) during the convalescence from this attempt to upset metabolism, an improved mental condition accompanies an improved bodily condition.

Summary.

From the above short account it will be seen that the administration of thyroid extract has been of great value as a means of treatment of melancholia with stupor, and of adolescent insanity. It is also useful as a means of diagnosis between cases of stupor and of marked dementia, the former reacting, the latter not.

Women seem to respond much more markedly than do men. It must be noted that relapses have occurred—in some cases to get well again under further treatment.

So that the above may be shorn of the personal element, opinions have been obtained from Drs. McDouall, Hogg, and Moffitt, and their experiences are as follows :—

Dr. McDouall states that “ he has used thyroid chiefly in cases of a katatonic nature, stuporous insanity, primary dementia, and resistive melancholia. His method of treatment is as has been stated above, *i.e.*, rapidly increasing doses and sudden cessation. He has found marked benefit to result in a large proportion of the cases treated, and thinks that it might be made more general use of, in the very early cases of insanity.”

Dr. Hogg states that “ he has used this method more or less constantly since about 1896, and that he is of opinion there is a certain class of mental patients, the stuporous and adolescent, in which it is most useful.”

Dr. Moffitt “ is of opinion that it is of great value in cases similar to those mentioned above; and also has observed that many patients, who before treatment were inert, lost, and confused, subsequent to treatment, although they did not arrive at a condition in which they could be discharged, became useful workers and took increased interest in life generally.”

THE TRAINING OF MENTAL NURSES.

By H. C. MCDOUALL, M.R.C.S. (Eng.); L.R.C.P. (Lond.);
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THE importance of this subject, not only to physicians in charge of hospitals for the insane, but to the community generally, considering the enormous and increasing numbers of cases of occurring insanity, is my excuse for bringing it before the notice of this Congress. At the present juncture especially, it is desirable that the whole question of the most suitable and efficient training for those who have to nurse the insane should receive further consideration because of the lately-initiated forward movement of the Australasian Trained Nurses' Association in providing a special department within that organisation for the registration of qualified mental nurses.

It is, perhaps, not necessary nowadays to urge the importance and benefits of courses of instruction by lectures and other means to those engaged in attendance on the insane, any more than it would

be necessary to advocate the proper instruction of ordinary medical, surgical, or midwifery nurses; it only remains, therefore, to concentrate our attention on the "how best to do it" aspect of the case.

It is not many years ago, viz., in 1887, that the systematic training of attendants and nurses at Gladesville Hospital, by lectures and demonstrations given by the medical staff, was inaugurated; then the course only extended over two years, that for the first year comprising sufficient elementary anatomy and physiology to excite the interest of the class and afford a scientific foundation on which to build a superstructure of rational treatment of medical and surgical emergencies. The second year's course included an outline of the structure of the central nervous system and its functions, followed by a description of the various forms of insanity as usually seen in the wards, advantage being taken of the opportunity to enlarge upon the appropriate care and treatment each variety required for its successful management. Dr. Eric Sinclair, then Superintendent of Gladesville Hospital, now Inspector-General of the Insane in New South Wales, was responsible for the initiation of this system of training at Gladesville Hospital, and he was so satisfied of its benefits in the improved service of the staff that he secured the extension of these teaching classes to the other hospitals for the insane in New South Wales, and has never ceased in his endeavours to promote, extend, and amplify the teaching and training of our mental nurses.

To this end, in 1905, was added a third-year course, and the whole system was at the same time revised, a new syllabus being drawn up by a committee of medical officers appointed for the purpose, the idea being not so much to increase the amount of information given as to allow a longer period for practical instruction in the wards, and the acquisition of further experience in the handling of mental cases before the granting of the certificate which should stamp the recipients thereof as thoroughly competent mental nurses.

As now carried out, the first-year course embraces:—Elementary Anatomy and Physiology of the human body; the Elements of Medical and Surgical Nursing and First Aid to the Injured. The second-year course commences with a more detailed description of the Nervous System and an Elementary Psychology leading on to a study of the various forms of insanity and how they should be nursed and managed, the course concluding with instruction on the nursing of patients seriously ill from bodily diseases. The third-year course continues the instruction on General Diseases, going more minutely into the symptoms that characterise them and the details of their nursing treatment. Then Elementary Hygiene is taught, so as to interest and instruct the pupils in prevention of the onset and spread of disease, especially of the more markedly infectious diseases. The ethics of nursing and the variation in the routine of nursing engendered by the treatment of cases of mental disease in private houses instead of in public hospitals are then considered. Finally, a lecture or lectures, to women students only, on Diseases of the Female Pelvic Organs, including a brief description of these organs and also the after-management of cases of childbirth, is given. A course of demonstrations and practical instruction in Invalid Cookery, covering six weeks, one afternoon a week.

is also carried out during this third year, and must be attended by the third-year class, though marks obtained therein are not at present considered in awarding the certificate.

These lectures, which are given by the medical staffs, commence in the beginning of May, last an hour each, and are continued once a week, with occasional interruptions for class examinations, until the end of September. In addition, during the first-year course frequent demonstrations in bandaging, &c., temperature and pulse-taking, bed-making, sponging, packing, &c, are given by the matrons, who start their instruction work early in February.

Written examinations for each of the three classes are held early in October, the papers for these being set by examiners appointed by the Inspector-General of the Insane, and after marking the papers these examiners visit the various mental hospitals in turn and subject the members of the first-year classes to a rigorous practical examination in bandaging and first aid, medicine-giving, temperature-taking, knowledge of instruments, and, in fact, every bit of practical work it is possible to take them on or through. The marks are awarded on a basis of 100 as full marks, and in order to pass a minimum of sixty is required. The marks awarded by the examiners are then added to or diminished by certain marks for ward efficiency, which have been allotted to each candidate by the superintendent of his or her hospital, the superintendent arriving at his valuation of efficiency from his own observation of the nurse, as well as by reports which he obtains from his matron, chief attendant, or the charge nurses or attendants of the wards in which the pupils have chiefly worked.

Those of the first year who have by these means succeeded in obtaining at least 60 per cent. of marks are, on concluding twelve months' service, appointed junior nurses or attendants, and the following year have to attend the second-year course. Those who have failed to obtain the 60 per cent. must leave the service under the present regulations, not being allowed a second try. Those of the second year who, by combined ward efficiency and examination marks, have obtained at least 60 per cent. are promoted and allowed to proceed to the third-year course the following year. Anyone failing to obtain the requisite number of marks at the second and third year examinations is required to reattend the lectures the following year, or from year to year, till they do pass, and meanwhile receive no promotion. After passing the third-year examination the certificate is issued, and, as showing the extent of the classes, I may mention that during the past six years 239 candidates have obtained this certificate from the six mental hospitals in New South Wales.

Two years' more work and experience in the wards sees a nurse or an attendant in the position of a senior, and thereafter eligible for the position of charge of a ward, and usually the chief attendants are selected from among those who have been in charge of a ward for some time, but for the most part the matronships have been filled in the past by sisters selected from general hospitals, some of these having been previously trained in our hospitals for the insane.

As regards the ward training, the probationers are placed at first in the Sick Bay or Infirmary Wards, and kept there for three months

if possible, so as to be properly initiated by a tactful and experienced charge into the close supervision and gentle care of the sick and infirm before experiencing the firmer, if not harsher, methods which association with the refractory cases in other wards is apt to engender. Later on, after passing the third-year course, the nurse is brought back to the Sick Bay, and put in nursing charge of those in bed and those requiring surgical dressings for a period of from three to six months, according to the exigencies of the particular hospital. In this way they complete and perfect their own training, and are able to help in the preliminary training of the probationers.

Such, then, is as far as we have got in the training of our mental nurses in New South Wales, and though we have succeeded fairly well on the whole, I am aware that there is room for improvement in the carrying out of even our present standard instruction. One of these defects is, I think, the want of a good text-book; so as to secure more uniformity in the extent of the teaching. Another improvement would be the examination of the cooking classes by one qualified teacher of cooking, who would award marks, such marks being included in the total obtained for the course. The chief defect, however, is that our certificated mental nurses are not eligible for selection to the highest nursing appointments in the service owing to their non-eligibility for registration by the Australasian Trained Nurses' Association. However, this association has this year instituted a mental section, to which may be admitted those mental nurses trained and certificated by the Government hospitals for the insane on their satisfying the council of the association as to their standard of general education, and on passing a further examination on mental nursing; but such members of the mental section are prohibited from undertaking the nursing care of a medical, surgical, or midwifery case under penalty of having their names removed from the register.

Now, as a matter of fact, nurses in mental hospitals have to undertake the sole nursing of any and every kind of medical case, and often of surgical and even midwifery cases, so that if we are to raise their status to a satisfactory level, and incidentally to retain in the Lunacy Department our most promising nurses, we must aim at something very much more than our present standard of education and training, even that our nurses shall be at least the equals of general nurses, and, when it comes to the question of the higher appointments in the service, have the advantage of a practical intimacy with the management of mental cases. This result may be achieved in at least two ways, one of which is to select from those who have done best in the aggregate one or more nurses from each mental hospital, and enter them as probationers for a two-year course at a general hospital approved by the Australasian Trained Nurses' Association, and, as the State subsidises these general hospitals heavily, and may in the future run them altogether, there should be no difficulty about the admission of the selected nurses from the State hospitals for the insane. After completing their two years' course in the general hospital, and passing the further examination of the Australasian Trained Nurses' Association, they would rank as fully trained nurses, and be registered as such, and then would be expected to return to duty in their respective mental

hospitals. This plan, though fairly simple in scope and easy of execution, has yet some very great disadvantages. Firstly, the question of pay. Nurses who have obtained their certificates in hospitals for the insane are in receipt of much higher salaries than are paid to the probationers in general hospitals, and it is not to be expected that they would, or in some instances could, consent to lose the difference in money. Secondly, the great likelihood of the permanent loss of their services to the Lunacy Department when qualified as general nurses, for having once broken their connection with mental nursing, and being now qualified to practice as trained general nurses, they may prefer to do so. But the greatest drawback would be that during their two years' absence from mental nursing they would get so out of touch with lunacy methods and the management of patients that when brought back into the service and placed in responsible positions they would be likely, at first at least, to prove less efficient than others, not so highly trained perhaps, but who have had continuous lunacy experience.

The alternative plan which commends itself to me is certainly more complicated, and would, in the first instance, cost the State a large sum of money to initiate; but this trouble and expense would, I think, in the long run be amply justified by not only securing the highest efficiency in mental nursing, but also by affording to the insane suffering from severe medical or surgical illnesses all the advantages of treatment which, if they were not insane, they could receive in general hospitals. This alternative plan consists, then, in the building of a Special Hospital for the treatment of medical, surgical, and midwifery cases occurring among the patients in the State hospitals for the insane. In this State this hospital would, of course, need to be situated in the near neighbourhood of Sydney, as the great bulk of our insane population is domiciled close to Sydney.

This proposed hospital would need to provide for forty beds to comply with the regulations of the Australasian Trained Nurses' Association. It would have one or more resident medical officers appointed, for periods of six or perhaps twelve months, from the ranks of the junior medical officers of the Department; and it would have a staff of visiting physicians and surgeons from the metropolis. The nursing arrangements would be under the direction of a matron, assisted by two or more ward sisters; the other nurses would be those selected for further training from the staffs of the several hospitals for the insane, who would draw the same salaries as they would have done if they had remained in their respective hospitals. After two years' course in this hospital, which might be called the "Government General Hospital," nurses would be eligible for the final examination and the full certificate of the Australasian Trained Nurses' Association, and would then be drafted back to the different hospitals for the insane, or would be eligible for filling the places of the ward sisters in the Government General Hospital as vacancies occurred. In this way it would be possible to establish two grades, as it were: one a pass merely, and the other an honours list, from which latter would come our future matrons of mental hospitals.

The initial cost of instituting such a hospital as I have in mind would, perhaps, prove less of a stumbling-block to the Executive if

to it were attached mental wards for the early treatment of nervous and borderland cases not requiring or justifying certification, but which cases are not usually welcomed in general hospitals. Such a ward for males only is at present in operation in connection with the Reception House, Darlinghurst, and its extension into a mental clinique for both men and women is a desideratum, and would be of great economic importance in preventing the complete development of insanity in many instances. The same administrative buildings and staff would do for both institutions, and so lighten the cost of each. Again, the filling of these forty beds from the hospitals for the insane in the State would release an equal number of beds in these hospitals, and so relieve the Government of the necessity of providing an extension of buildings for an equivalent number.

An objection that might be raised to the establishment of the hospital I have described would be that the taking away for treatment elsewhere of all the most interesting medical and surgical cases would tend to monotonise the routine work of the medical and nursing staffs of the hospitals for the insane. My reply to such an objection would be that the true interests of the medical and nursing staffs of these hospitals ought to be of a psychiatric character; that is, they should devote themselves to the mental healing of their cases; and besides, there would be always enough of cases of minor surgery and temporary ailments to prevent the staffs growing rusty in ordinary medical and surgical procedure. The junior medical officers, who might be expected to most regret the "flesh-pots of Egypt," in the shape of exciting medical and surgical cases, would by turns have their fill of these in the Government General Hospital, and thereby refresh and amplify their medical and surgical knowledge.

There is one more question affecting the training of mental nurses which I will only lightly touch upon, and that is: Should we not now consider the advisability and possibility of systematising the training of mental nurses throughout the Commonwealth, or indeed throughout Australasia? I think it would improve the status, and ultimately the efficiency, of the mental nurses to do so, and it could be carried out under the ægis of the British Medico-Psychological Association, papers being set in England, and the answers being sent there for marking; but this would be a cumbrous and unsatisfactory procedure, and the *viva voce* and practical examination, which is of much importance, could not well be carried out. Another plan would be to first establish an Australasian Medico-Psychological Association, and then give the body thus created power to arrange examinations throughout Australasia, and grant certificates.

To sum up: What are we likely to gain by taking all the trouble involved in the systematic training of our mental nurses? Firstly, the attraction to the service of our mental hospitals of a higher stamp of probationer than is otherwise likely to occur. Secondly, the securing of the highest possible efficiency in the nursing and care of the mentally afflicted. Finally, the retention in the service of the State Lunacy Department of the best and brightest of its Hospital alumni by raising their status and opening to them the avenues leading to the higher nursing appointments within its scope.

NEURASTHENIA.

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BEFORE we enter upon a discussion of neurasthenia we must ascertain as nearly as possible what this name is to signify. Anything like precise definition in the biological sciences is, of course, impossible; but we must have a fairly uniform idea of a particular group of cases if we are to apply to it a definite label. If our label is to be shifted about from one group to another, consistent argument becomes impossible. It matters little what the name may be so long as it is consistently applied, and that the series of symptoms, both positive and negative, to which it is applied recur with a uniformity sufficient to justify their being gathered into a class. Then, having applied such a name or label we must leave it alone, and must not busy ourselves to return upon any primary meanings or etymology of the name itself. Names in the lapse of time become variously distributed, and gather many accretions of meaning and connotations, which prevent our continuing to use the name freely in an original sense. It is unfortunate when a name has any etymology at all, when it is not a simple word such as "measles" or "asthma"; and it is peculiarly unfortunate in the case of neurasthenia that authors, with an eye to its etymology, persist in applying it to any sort of feebleness, nervousness, or debility, as, for instance, to convalescence from other maladies, to various disabilities due to the more latent chronic disorders, to sundry toxic conditions, and so forth. It may be urged, it is true, that clinical observation has failed hitherto to prove completely that the series of symptoms positive and negative with which we are now concerned recurs with a uniformity sufficient to make it worth while, or even possible, to classify and to attach a name to symptoms so incoherent and indefinite. This must be a matter of clinical opinion; of course, all classification is arbitrary, and subject to convenience. For my own part I think that a fairly uniform series of the kind is to be made out, and is distinctive enough to require recognition under some specific name.

A malady which consists chiefly, as neurasthenia confessedly does, in a complexity of symptoms mainly subjective, offers, indeed, farther special difficulties to positive methods of research. Psychosensory and psychomotor movements, multiform associations, capricious causes near and remote, many of them elusive, are such, no doubt, as to have prevented us so far from elucidating neurasthenia with anything more than the approximations of sagacious insight and rule of thumb. And these difficulties are infinitely increased by the self-consciousness and introspective habits of men and women, especially of ailing men and women, who by ailment are disabled more and more from setting their own symptoms forth without perversion or exaggeration. Still, by comparing a vast number of cases, recorded by a host of physicians, both at home and abroad, we shall find on the whole sufficient agreement to justify us in accepting neurasthenia as a fairly consistent clinical series, and as this name is generally accepted we must be content with it. Moreover, during the last few years something like scientific method has been applied to the differentiation of neurasthenia proper. Time forbids me

now to discuss all the methods of this research, as pursued by Kräpelin, Amberg, and Specht, and by Rivers and M'Dougall; but we may say that the main lines of the diagnosis of neurasthenia are being laid out.

The enormous advances which, during the last two generations, have been made in the description of certain diseases have led us to suppose that such diseases, novel in their ampler description, are a new infliction on mankind. If Beard was one of the first physicians to work out a formal description of neurasthenia, this disease, clinically described or not, is ancient enough, and may be coeval with all human societies. It is probable that neurasthenia, like some other non-fatal maladies, may receive in modern societies an attention and a regard denied to it in rougher ages, and to this extent, and by this very toleration, it may now be fostered. But, as I have said more at length in my article on this subject in the eighth volume of Allbutt and Rolleston's "System of Medicine," neurasthenia is common to all classes of society, to all callings of life, and to all countries, so far as we know, whether secluded and stationary or energetic and progressive, and does not owe its origin to culture, luxury, or what is often called "Civilisation," however much under these conditions it may command attention.

The malady is common to the two sexes; but women, if on the whole less subject to it than men, are more prone to breakdown suddenly. Such a breakdown may occur after too long a term of study or too severe a course of exertion; although for a long while the stress was borne with apparent ease. But these sudden breakdowns are far more difficult to cure than the cases which come about more gradually, and, therefore, receive treatment at an earlier stage.

As regards age, it is difficult to say whether, apart from dyspeptic and other visceral disorders, neurasthenia proper occurs in children. In children, bad teeth, worms, phimosis, eye-strain, feebleness of mind, and so forth must not be forgotten. Moreover, children and young persons grow through strange and perplexing phases of bodily growth and mental development, phases which cannot be called altogether abnormal, and which often alternate with each other or cross each other. Neurasthenia is a disease rather of adolescence and early maturity. Apart from some traumatic cause, it rarely breaks out for the first time in elderly persons; and any simulation of it in elderly persons must give rise to suspicion of some underlying and graver malady.

If, on the whole, neurasthenia may be described as consisting in certain broad and general features which, perhaps, in this brief paper, I may take as fairly-well known, yet within this larger outline there are subdivisions which, from the point of view of clinical interpretation, are found convenient. I think the following well-known divisions, or I should rather say points of view, are of practical service:—

- A.—The Cerebral form;
- B.—The Spinal;
- C.—The Cardio-Vascular;
- D.—The Visceral;
- E.—The Urogenital;
- F.—The Traumatic.

These subdivisions are based upon various local conditions which do not alter the nature of the cases, but give different colours to them. In large institutional records the cerebral cases make up about 30 per

cent., and the cerebro-spinal about 50 per cent.; the gastric and cardiac cases being comparatively a small minority. The number of traumatic cases must depend, of course, very much upon the classes or occupations upon which the observer's experience is based.

A.—Cerebral form. In my article, already mentioned, I have gone so fully into its variable and elusive symptoms that I must not now occupy you with anything like a description of them. The weariness of brain, a condition of which we are all conscious when fagged or short of sleep, is in the neurasthenic persistent; and the sleep, by which restoration should come, is often light, variable, and evanescent. It is not true, however, to say that even in cerebral cases sleep is always defective; this is the rule, but in some of these cases the sleep on the whole is fairly good. The headache, although it generally has something characteristic about it, at any rate when taken with other symptoms, must nevertheless be very carefully considered. Often, it is true, the alleged headache is of the nature of an obsession, a habit of consciousness readily forgotten when the attention is diverted, or forgotten, for longer periods, under other overmastering impressions. It is needless to say how important it is in such cases that the closest expert attention should be given to the eyesight. No cursory investigation of this point is sufficient. Time after time I have had opinions even from experts concerning the eyesight of such a patient which proved to be inaccurate. Now in such a susceptible state a very small aberration may suffice to keep up continual trouble, so that the optical examination must be expert, patient, and exhaustive. Cerebral neurasthenia is consistent with the appearance of vigorous health, and even with considerable bodily activity and some endurance. Such a person living a country life, and then not seeming to others to have much the matter with him, may nevertheless be utterly incapable for a while of returning to professional work. Attention and mental energy soon give out. The neurasthenic draws his water from surface wells which soon run dry. In other cases the whole system flags; the patient seems to droop as his thoughts evaporate; his voice fails and his skin may sweat; although the general bodily signs, such as the pulse and general nutrition, seem to betray no grave defect. It is in these cerebral cases, and not infrequently under this semblance of good bodily health, that obsessions occur, a distressing feature of neurasthenia now too well known to need description in this place. On the distinction, a distinction in some cases not without difficulty, between obsession and insanity, between haunting conceits and delusions, I have dwelt at length in my former paper. Cerebral neurasthenics often complain of vertigo, especially on stooping; or of a lurching sensation in gait. In such cases the ears must be carefully examined to exclude vertigo of aural origin.

B.—It is in the Spinal form more especially that the general weary aching is complained of. It is not always easy to distinguish this aching from that due to toxic influences of other origin. In neurasthenia, I think, it is due not so much to toxic causes as to a slackening and loss of tone in the muscles, so that their masses drag heavily upon their ligamentous and tendinous attachments. This atony, often correlated with a knee jerk which, even if not itself very excessive, may throw the whole body into agitation, leads one to speculate upon the part of the cerebellum in neurasthenia. It is in these spinal or cerebro-spinal cases

that sensations of numbness, tingling, coldness in the limbs are so vexatious. In all neurasthenics the reflexes are apt to be exaggerated, but especially in the spinal cases. There is no better single sign of amendment than a diminution in this excessive reflex excitability.

C.—In the Cardio-Vascular form the atony is more of the blood vessels than of the voluntary muscles. The arteries are relaxed and throbbing, and there are evidences of great vasomotor instability; at some times the patient becomes cold and torpid, or chilly with a general vasoconstriction; at other times he blushes in patches or burns all over, with or without sweats. Such persons are liable to the vaso-vagal attacks of Sir William Gowers; when the pupils dilate, the pulse vanishes, and faintness or restlessness, with slight delirium or bewilderment, or even slight loss of consciousness, may set in. But usually in such cases the blood pressures, except transiently under excitement, are normal. It is said that in neurasthenia the JP wave of the electro-cardiogram is strongly expressed. Attacks of panting belong rather to hysteria. Mock angina pectoris also is not infrequent in neurasthenic persons, it belongs, indeed, especially to neurotics; but for the practised observer, who has the whole of the data before him, the true nature of the case will very rarely be in doubt. In a diagnosis of cardio-vascular cases it is of the utmost importance to be sure that the disorder is not one of tea, coffee, or tobacco poisoning. Many and many a time have I been called to cases of supposed neurasthenia which really belonged to one or other of such categories. Some persons are extremely susceptible to these alkaloids, so that a moderate use of them may in course of time set up even alarming symptoms. Nothing short of six weeks' abstinence can settle this question in diagnosis. Unfortunately neurotic persons are more apt than others to use these substances, or alcohol, or morphia, in excess.

D.—Under the head of Visceral Neurasthenia the most important points of emphasis are dislocations of some internal viscus, such as the kidney or uterus; or slackness of the abdominal tone, so that these parts are pendulous, and the whole of the abdominal viscera may drop together. Dyspepsia, constipation, spasms of the colon with sausage-shaped or cordlike tumours in the course of the large bowel, may so act and react with the general neurasthenia as to postpone recovery until these various local conditions have been thoroughly dealt with. Mucous colitis is only too well known as a tedious feature of such cases. Gastralgic sensations, loss of appetite and emaciation may occur, not only in the type and to the degree of "Anorexia nervosa," but also in elderly weary persons, when a suspicion of gastric carcinoma may arise. Such a problem may be one of extreme difficulty, and as gastric secretions depend much upon temporary fancies of taste and appetite, chemical methods may be of very little help in diagnosis. In such cases only time, and a very careful weighing of the whole circumstances of the individual patient, can lead to a solution of the problem.

E.—The Urogenital form.—There is, perhaps, no more unwelcome visitant in the physician's waiting-room than the sexual neurasthenic; and the least welcome are those who, by slackness or caprice of moral fibre, have dabbled in dirty ideas until mind and body have fallen into a common frailty. Acting and reacting upon each other, the only way out is by medicine for both, and the physician may not be in command

of both dispensaries. Still by a sympathetic yet high-minded and frank counsel he may do much, and at least he may refrain from probing into the details of a prurient mind, and from aiding in the development of squalid images generated of concupiscence or morbid introspection, which left in their darkness might disappear. Many, perhaps most, of these patients find a delight in posing, both to themselves and to others. On the other hand there are those, and not a few, who honestly, if perversely, have worried themselves into illness by dwelling upon, exaggerating, and fixing into habit sexual irregularities or sensations within the pelvis originally of no, or of little importance; such persons deserve and benefit much by careful and conscientious consultation and treatment, and in my longer paper I have considered such cases more fully. More lately I have had my attention drawn to the recognition of a chronic posterior urethritis in the male, attended with tiresome irritation or burden, almost forcing the sufferer into impatience and uselessness. This is but an example of the many possibilities of local annoyance or disease which, if cure is to be attained, must first be removed. But it is not quite clear that such cases of local disease with excessive general reaction are precisely to be called neurasthenia, at any rate in the first instance; though by them a patient may be driven into the malady. On many such local affections in the genital systems of women and with neurasthenic consequences, Dr. Macnaughton-Jones has written in the *Practitioner* for January of this year.

A careful and repeated examination of the urine is necessary in all cases of neurasthenia with discomfort in these areas. Irritable bladder, weight or other morbid sensation in these tracts may prove to be due to, or aggravated by, some chemical perversion of the urinary secretion; by oxaluria, azoturia, and so forth, or traces of albumin or sugar may throw light upon other sources of discomfort or disorder. Examination per rectum may detect a diseased appendix, a sigmoid or uterine displacement, a fissure or a pile, so that local treatment might relieve the patient of the cause of his miseries.

F.—The Traumatic form of neurasthenia has so far features of its own that we are justified in treating it distinctively. This variety, however, does not depend altogether upon severe mechanical injury, but also upon slight injury, or only mental shock, attended with alarm or stupefaction. This form of neurasthenia has been recognised and carefully described by many writers, such as Oppenheim, Page, Horsley, Clinton Dent, and others, to whose writings I may refer for full details. Traumatic cases may be divided into acute and chronic. In the acute form the patient, although dazed and inattentive, may answer clearly when spoken to; or he may be excited and restless, as it were hysterical; or he may alternate between the dazed and the excited condition. Between this and the chronic form there are of course many intermediate cases. In the acute form the sleep is always grievously affected, often broken up by evil dreams. Rises of temperature, even to extraordinary heights, may occur; but they are always very transient, are quickly subdued by cold sponging, and are not attended with emaciation. Intolerance of light and sound is intense, and after bodily accident there may be an interval of very grave doubt whether the brain has been injured or not; so that absolute rest in bed in a quiet chamber with subdued light, a treatment happily suitable at first in either case, must be insisted

upon, perhaps for some days, before a definite opinion can be given. In the chronic form a very remarkable and not infrequent feature is an incubation period between the shock and the manifestation of symptoms; and such an interval, instead of being a character of falsity, is rather a note of genuineness. The interval is often a week, but it may be longer, even two or three weeks; when the first symptom may be that the patient finds it a special effort to write a simple letter or to read a plain document. His sleep then becomes dreamy and broken, he is irritable and hyper-sensitive. Convulsive seizures are seen in England only occasionally. I remember only one case, in a young woman, of the full manifestation of convulsive hysteria after an accident, a railway accident in which no very serious bodily injury was sustained.

It is convenient here to anticipate matters by some distinction between traumatic neurasthenia and hysteria; if, indeed, such a distinction can be altogether maintained. On the sensory side in this malady the curious suspensions of cutaneous sensibility are infrequent, but in the motor field parietic conditions are more frequent than in ordinary neurasthenia. They may simulate organic disease, even somewhat closely, especially in the paraplegic or hemiplegic forms. The monoplegic pareses are less equivocal. Babinski's sign is absent; as a rule the reflexes are exaggerated and ankle-clonus may appear to some extent in the functional disorder. Mr. Page has emphasised the general stress upon the muscles, ligaments, and articulations of the spine, especially in the lumbar and dorso-lumbar region, held tight at the moment of jar; so that afterwards the patient holds his back stiffly, and rises cautiously from his seat. The fibrous tissues are tender to deep pressure, and are apt to ache on changes of weather. In many of the cases, which notwithstanding seem to find a place in the category of traumatic neurasthenia, the "trauma" may be slight, nominal, or even inappreciable. Protracted ill-health, however, not infrequently follows such slighter accidents in cases in which there is no temptation to deceit, or, indeed, where disablement is contrary to the interests of the patient. The mental or "suggested" conditions of such perilous events contribute indefinitely but, perhaps, largely to the results; for physical injuries of far greater extent may be sustained in games, or in other such cheerful circumstances, without much consequent harm.

As a special class of traumatic neurasthenia we may place the "post-operative" cases of neurasthenia now recognised by all surgeons of experience. Though the local disease may have been removed, the patient remains weak, and does not recover energy or self-control. Injuries of warfare again are mingled with and intensified by fear, excitement, exposure, privation, and fatigue.

Of the pathology of neurasthenia we know accurately nothing. It is often accompanied by vasomotor instability, but this is rather of the nature of incident than of the essence of the disease. Moreover, in discussing the pathology, we are met by the real difficulties and the careless confusions of diagnosis. Toxic conditions of the body are either assumed in neurasthenia, without any evidence worthy of the name, or toxic, chronic, or dyspeptic conditions of a more definite kind are called neurasthenia merely because the patient feels vaguely ill. Arterio-sclerosis may well co-exist and co-operate with neurasthenia; but to assume that neurasthenia consists in arterial disease is a similar error of diagnosis.

The standing rule should be not to pronounce a case to be simple neurasthenia until every other possibility is exhausted. Latent organic disease, such as visceral carcinoma, larval Graves' disease, subtle changes of an organic kind in the brain or spine, neuritis, Addison's disease, latent gout, secret causes of mental depression or anxiety, obscure metabolic perversities of the kind often attributed to "liver," the secret use of drugs or the abuse of tea, coffee, or alcohol, oral sepsis, eye-strain—for, as I have said, even minute errors of refraction may set up very various and incalculable distresses—the grumbling and discontent of selfish and undisciplined persons, or of self-deceivers and deliberate malingerers, are among the many conditions from the midst of which a diagnosis of neurasthenia may have to be extracted or dismissed. And, again, it is scarcely precise to give the name of neurasthenia to the transient fatigues of highly strung persons of fervid temperament and intense activity, whose lives alternate between excessive work and excessive fatigue although, no doubt, such persons are prone to the malady. Into the differential diagnosis of all this mob of disorders it is impossible now to enter. To touch upon a few points only: the distinction between hysteria and neurasthenia is very important in respect of prognosis. The cure of neurasthenia is at best a matter of many months; a case of hysteria may be cured in a few days, a few hours, or a few minutes. I have emphasized these points of distinction in my article on neurasthenia, and they are set forth in most of the text-books and essays on these subjects; I may refer here, for instance, to the able remarks on the diagnosis in a paper* by Doctor Rennie of Sydney. Some of the symptoms of eye-strain, such as obsessions—agoraphobia especially, as I have shown elsewhere—and vertigo, may be identical with the same in neurasthenia. I may note also that muscular fatigue, aching and lassitude may be due to so-called "rheumatic" fibrosis, in which malady, however, we may expect to find fibrotic nodules. And finally it must not be forgotten that neurasthenia may co-exist with some other malady.

Malingering is a very serious difficulty, from both the medical and social aspects of the matter. Fortunately deliberate deception, whatever hereafter may be the effect of recent legislation, is much less common than is supposed. Oppenheim, Professor Glynn of Liverpool, and others do not put it at more than about 4 to 5 per cent.; indeed, to include the graver degrees of "subconscious" exaggeration also, probably, would not carry the percentage very much higher. Nevertheless the degrees in which a brooding temperament, the anxieties of disability, bodily discomforts intensified by introspection, fretfulness, and so forth may be aggravating or perpetuating an otherwise mild neurasthenic condition, must be exceedingly difficult to estimate, and in such cases diagnosis may be very much a matter of sagacity and rule of thumb. Many preciser tests have been proposed, as for instance by Müller, Bechterew, and others; but if effectual they are not yet adapted to ordinary practice, nor yet, perhaps, fully worked out. It seems probable, however, that certain laboratory methods, and particularly those of Kräpelin in Germany and in England of Rivers and McDougall, may prove serviceable. Rivers' method is to test the capacity and endurance of the patient for hitting dots made to pass a slit at determinable rates; fatigue being betrayed by

* *British Medical Journal*, May, 1911.

inaccuracy of aim. After laboriously plotting out standard curves of this kind for normal persons under precisely uniform conditions of health and circumstances, certain characters were definitely ascertained; certain main and certain subordinate features being determined, so that variations under fatigue or ill-health can be brought into comparison with them and with each other. These features are so far notable, correlated, and uniform that even skilled assistants fail to reproduce them by any plot of simulation; while the attempts of outsiders are quite clumsy. By means of these standard curves these methods are now being carried forward from research into practical use.*

From hypochondriasis, and from modes of insanity, such as melancholia, the diagnosis, as a rule, is not difficult.

The treatment of a case of neurasthenia is a very serious business. Months of methodical and incessant attention may be impaired by some want of foresight, or some lack of personal ascendancy, in the physician or his trained assistants; or may be wrecked by the injudicious interference of officious friends. As with pulmonary tuberculosis so with neurasthenia, it may prove to be desirable that all cases should be treated in sanatoriums specially adapted for the purpose. For the patient must thoroughly understand from the outset that no casual consultations, no incidental prescriptions, whether of drugs or other means, will of themselves be effectual; while inconsistent methods, plans ill thought out, harkings backwards or forwards are fatal to success. The first essential is, of course, a closely accurate diagnosis; no corner of the patient being left unexamined, no relevant facts in his story unnoted. A local disorder, even comparatively trivial, may enchain the patient in a vicious circle, not to be broken till the flaw is removed; such, for instance, as a displaced viscus, a faulty eye, a chronic rhinitis, a fissure of the anus, or piles; and so on, no irregularity or defect must be overlooked. I have ventured to call your special attention to the question of posterior urethritis, which, I believe, in some of my cases, has been an important but an inadequately studied factor in keeping up a neurasthenic state. Having thus dealt with every obstacle, the method generally known as that of Weir Mitchell, under its several variations according to individual peculiarities, will be the chief method of treatment. But this method needs an intelligence and discretion in attendance and management, and a degree of manipulative skill which it is far from easy to secure. In some cases dietetic methods are of immediate importance, in most they are of secondary importance. Generally speaking, the Mitchell treatment should precede treatment by climate or spa; and systems of packs, baths, douches, &c., carried out with scientific knowledge and sagacious judgment are more useful than mineral waters. Electricity finds some place also in the treatment. The high frequency current, and the careful use of faradic baths are gaining ground in my own and in general opinion.

Suggestion is of far less service in neurasthenia than in hysteria; but it may be incidentally useful in sleeplessness, in some phases of irritation, and in the dispersal of obsessions.

* Rivers: Influence of Drugs on Fatigue (Croonian Lectures, R.C.P., 1906, London, 1908) and Kräpelin (Kräpelin's Psychol. Arbeiten, 1896, Bd. I); Rivers and McDougall, *Brit. Journ. Psychol.*, 1905, I). For a much larger bibliography I must refer to my article in Allbutt and Rolleston's System of Medicine.

Drugs play a subsidiary part in the cure of neurasthenia; though, of course, on the other hand, for occasional uses they are indispensable. On the well-known precautions in the use of sedative or soporific drugs I need not insist. Constipation often yields, with but little drug assistance to skilful abdominal massage. The so-called "tonics" are useful incidentally. In convalescence the advance from occupation to occupation, from exercise to exercise, needs the greatest discretion, for, in contrast with hysteria, a chance excess of work may undo the advantage of many weeks' improvement. A very large part of convalescent occupation should be manual rather than mental work. It is well, as soon as may be, to arrange for the convalescent exercises with cheerful companions; and a quick eye will learn to perceive when rest is degenerating into dawdling and coddling, and when a cautious return to activity is required. For in many of these patients moral education is as important as the physical; in children and young adults the moral education is of the utmost importance; in older persons, habits good and bad are too often fixed and permanent; thus it is very important not to let the child hear what has been called the "formula of his defects," lest he act up to the character, and so fix his more fluid dispositions on perverted lines.

ON THE DOCTRINE OF COMPLEXES.

By C. G. JUNG, M.D., LL.D.

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It is difficult to express in a short summary the doctrines laid down in my two books, "Diagnostic Association Studies" and "The Psychology of Dementia Præcox." What I state here must necessarily be incomplete and superficial.

My theoretical views on the neuroses and certain psychoses—especially dementia præcox—are founded upon the psychological outcome of the "*association-experiment*." These experiments are used for the demonstration of certain intellectual types, but I must here mention that an important point was formerly disregarded, namely, the disturbing influence of the experiment on the subject. Thus, in my practice of using a series of "*stimulus-words*," and allowing the subject to react to them, that is to give answers to each word, often the reactions do not come with equal smoothness, but very irregularly, or with lengthened intervals; or there appear other disturbances such as repetitions of the stimulus-word, slips of the tongue, several reaction-words instead of one, &c. These irregularities were formerly regarded as mere faults of the experiment, and not taken into further consideration. In collaboration with Riklin, however, I have now given special attention to these disturbances. Noting at which stimulus-words they occur, we find that it is principally where a stimulus-word refers to a personal matter, which, as a rule, is of a distressing nature. Often the relation between the two is not clear at first glance, but is rather of a "symbolic" character, it is in fact an "allusion." Usually there are only a few personal matters to which the disturbances of the experiment refer. Riklin and myself have introduced for this "personal matter" the term "*complex*," because

such a "personal matter" is always a collection of various ideas, held together by an emotional tone common to all. With practice and experience one may easily attain the faculty of collecting those stimulus-words which will most likely be accompanied by disturbances, then of combining their meanings and deducing therefrom the intimate affairs of the subject. It is obvious that this procedure is of special importance in a psychological examination of patients. (It is important also to note the use of the procedure in criminology; I, myself, have detected by its means two cases of theft.) Here I must mention that nearly all the German authorities have pronounced against the method, but its use is generally recognised in Switzerland and in the United States of America. French and English psychiatrists are as yet unfamiliar with the method.

The experiment, which I perform usually with a hundred specially selected and collocated stimulus-words, serves as an indication of the psychic contents of a patient and his mode of reaction. This is of special importance with regard to the neuroses, the psychic origin of which present-day observers no longer doubt. Somatic states are never the real, but only the predisposing causes of the neuroses. The neurosis itself is of psychic origin, and emanates from "special psychic contents," which we call a "*complex*." It has been discovered that the complexes revealed by association-experiment are either pathogenic conflicts or at least nearly such, so that by association-experiment the pathogenic complex is easily located. If one wishes to penetrate still further into the psychological connections of a neurosis, one must have knowledge of Freud's psycho-analytic method. But for a superficial grasp of the psychic contents of a neurosis the association-experiment is quite sufficient. It is interesting to find that the experiment discloses thought-complexes, which were not mentioned at all in the history of the case. The obvious reason for this is the distressing character of the complexes. At the outset, patients do not talk to the doctor quite frankly about more private matters, and it is precisely these matters which have the most important bearing on the genesis of the neurosis. That these painful private matters are mostly conflicts of a distinctly psycho-sexual nature is to the unprejudiced judge of human nature a matter of course. Occasionally the psycho-sexual conflict is very deeply hidden, and can be discovered only by psycho-analysis. In many cases the aroused complex is by no means approved by the patient, who even tries in every way to deny, or at least to weaken, the existence of the complex. Since it is therapeutically important to induce the patient to self-recognition, *i.e.*, to a recognition of his "repressed" complexes, one must take this fact into careful consideration, and proceed with corresponding care and tact.

The association-experiment provides the means of studying experimentally the behaviour of the complex. Experience teaches us the close relation between complex and neurosis. We must assume that the complex is a thought material, which stands under special psychological conditions, because it can exert a pathogenic influence. In the association-experiment we first observe that it is the intention of the subject to react quickly and correctly. This intention is disturbed by the interference of the complex, so that the association, contrary to expectation, is either turned from the sense of the complex or replaced by fragmentary allusions,

or is in general so disturbed as to render the subject altogether unable to produce a reaction, although he may be unaware that the complex is independent of his intentions. The same observation is confirmed by applying the so-called "*reproduction-method*." If after the finished association-experiment we let the subject repeat all the reactions to the different stimulus-words, we find the uncertainty of recollection (the so-called faulty reproduction) usually at those places where the complexes have interfered (though we must not lose sight of the perseveration factor of the complex). Therefore, the "faulty reproduction" is also to be regarded as a sign of the complex, and this is theoretically interesting because it shows that even the moods associated with a complex are subject to certain exceptional conditions, that is, they are inclined to be quickly forgotten or replaced. The uncertainty of the subjects towards the complex associations is characteristic; they are to the individual either of an obsession-like stability, or they disappear totally from the memory, and may even cause false memories—as may be well observed "*in nuce*" during the experiment. This points also to the complex and its association material having a remarkable independence in the hierarchy of the psyche, so that one may compare the complex to revolting vassals in an empire. Researches have shown that this independence is based upon an intense emotional tone, that is upon the value of the affective elements of the complex, because the "affect" occupies in the constitution of the psyche a very independent place, and may easily break through the self-control and self-intention of the individual. The "affect-intensity" of the complex can be easily proven psycho-physically. For this property of the complex I have introduced the term "*autonomy*." I conceive the complex to be a collection of imaginations, which, in consequence of this autonomy, is relatively independent of the central control of the consciousness, and at any moment liable to bend or cross the intentions of the individual. In so far as the meaning of the Ego is psychologically nothing but a complex of imaginations held together and fixed by the coenesthetic impressions, also since its intentions or innervations are "*eo ipso*" stronger than those of the secondary complex (for they are disturbed by them), the complex of the Ego may well be set parallel and compared with the secondary autonomous complex. This comparison shows the existence of a certain psychological similarity, because the emotional tone of the secondary complexes is also based upon coenesthetic impressions, and, further, both the Ego and secondary complex may be temporarily split up or repressed, a phenomenon which may be observed with particular clearness in hysterical delirium and other "cleavages" of personality. Especially in those states where the complex temporarily replaces the Ego do we see that a strong complex possesses all the characteristics of a separate personality. We are, therefore, justified in regarding a complex as somewhat like a small secondary mind, which deliberately (though unknown to consciousness) drives at certain intentions which are contrary to the conscious intentions of the individual. Hysterical symptoms are the products of these counter-endeavours; they originate from the complex, and are all the more intense and obstinate the greater the autonomy of the complex is. I may say here that the superstition held by all races that hysterical and insane persons are "possessed" by demons is right in conception. These patients have, in fact, autonomous complexes,

which at times completely destroy the self-control. The superstition is therefore justified, inasmuch as it denotes "possession," because the complexes behave quite independently of the Ego, and force upon it a quasi-foreign will.

By means of the association-experiment, aided by Freud's psycho-analytic method, I have succeeded in proving that all neuroses contain autonomous complexes, whose disturbing influences have a disease-producing effect. Amongst the psychoses, Kraepelin's dementia præcox has undoubtedly proved itself a "complex disease," at least in its initial stages. (I regard the noted but still unconfirmed anatomical alterations as secondary.) In this disease the autonomy of the complexes may sometimes be observed with surprising distinctness, for instance, the overpowering force of "voices," the obsessions arising from katatonic impulses, &c.

The objection that neuroses and dementia præcox are totally different affections, and cannot possibly be founded upon the same disturbances, I can only meet here with the suggestion that more or less autonomous complexes occur everywhere, even in so-called normals. The question is, to what extent are the complexes really autonomous, and in what form does the reaction take place? The researches of Freud and his school have shown how hysteria reactively deals with the complexes, while the work of the Zurich school has shown a characteristic and different behaviour of dementia præcox; with this, however, I cannot deal here at length. I may say only, that certainly in both the neuroses and dementia præcox the symptoms—whether of a somatic or of a psychic nature—originate from the complex as has been described in detail by the school of Freud. While in hysteria there occurs usually a continuous accommodation to the surroundings, in consequence of which the complexes are subjected to continual alterations, in dementia præcox on the contrary the complexes are fixed, so that they usually arrest the progress of the general personality; this we call dementia. In estimating the extent of this dementia some authors have gone much too far in assuming that the repulsive and degenerate exterior of the patient is the result of an equally great interior decay. This is quite incorrect, because the patients still possess a very vivid life of phantasy, of which, however, they are able only in exceptional cases to give utterance. In these phantasies, of which in some instances the patients are quite unconscious, they deal with the fixed complex in a way which is intensely interesting to the observer. In fact this is the workshop where delusions, hallucinations, &c., are produced from really sensible connections. The direction of thought is, however, entirely turned away from reality, and prefers thought-forms and material no longer of interest to modern man; hence many of these phantasies appear in a purely mythological garb. Owing to the loss of the recent biological train of suitable thought, there is apparently substituted an antiquated form. (I may refer here to a similar conception of the hysterical symptom by Claparède and Janet.)

In this short summary I have been forced to restrict myself entirely to indications and assertions. Proofs have not been offered, because the subject has already reached the extent of a special science, a science which may be called "*Analytical Psychology*," or after Bleuler, "*Deep Psychology*"—"Tiefenpsychologie".

In conclusion I would draw attention to the following publications. An account of all works on association methods will be found in:—

Jung. Diagnostische Associationsstudien. Band I and II. J. A. Barth, Leipzig.

A summary of these methods in the English language appeared in "Lectures and Addresses delivered before the Departments of Psychology and Pedagogy," in celebration of the 20th anniversary of the opening of Clark University, Sept., 1909, Worcester, Mass., 1910.

These lectures contain an account of the practical application of the experiments in a case of theft.

Further details may be found in:—

Jung. Die psychologische Diagnose des Tatbestandes. Marhold, Halle.
Peterson and Jung. Psychophysical Investigations with the Galvanometer and Pneumograph in Normal and Insane Individuals. Brain. Vol. 30. 1907.

Jung. On Psychophysical Relations of the Association-experiment. *Journal of Abnormal Psychology*. Vol. I.

Details concerning my conception of the neuroses and psychoses may be read, partly in Vol. I of my "Diagnostische Associationsstudien," partly in Jung, "The Psychology of Dementia Præcox"—*Journal of Nerv. and Ment. Dis.*, New York, 1909; also in Jung, "Ueber die Psychologie der Dementia Præcox"; Marhold, Halle; and in Jung, "Der Inhalt der Psychose." Deuticke, Wien.

Proofs on the resumption of antiquated forms of thinking are as yet published only in part. A general presentation of the problem may be found in—

Jung. Wandlungen und Symbole der Libido. Jahrb. f. Psychoanalyt. u. Psychopath. Forschungen. Deuticke, Wien. Band III. 1911.

ON PSYCHO-ANALYSIS.

By Prof. SIGM. FREUD, Vienna.

At the friendly request of the Secretary of your section of Neurology and Psychiatry I take the liberty of directing the attention of this Congress to the subject of psycho-analysis, which at the present moment is being extensively studied by neurologists and psychiatrists in Europe and America.

Psycho-analysis is a remarkable combination, which includes not only a method of examination of the neuroses, but also a method of treatment based on the etiology thus discovered. I may say, to begin with, that psycho-analysis is not a child of speculation, but the result of experience, and for this reason, like every new product of science, is unfinished. Everyone is invited to convince himself by his own investigations of the correctness of assertions contained herein, and to help in the further development of the study.

Psycho-analysis began with researches on hysteria, but in the course of years it has extended far beyond this field of work. The "Studies on Hysteria," by Breuer and myself, published in 1895, were the beginnings of psycho-analysis; they followed in the track of Charcot's work on "Traumatic Hysteria," Liébault and Bernheim's "Proof of the Hypnotic

Phenomena," and Janet's studies on "Unconscious Psychic Processes. Psycho-analysis soon put itself into sharp antagonism with Janet's opinions, because (a) it refused to trace hysteria directly to a congenital hereditary degeneration, (b) it offered instead of a mere description a dynamic explanation by a play of psychic forces, and (c) it referred psychic dissociation (the importance of which had also been recognised by Janet) not to a psychic synthesis arising from a congenital disability, but to a special psychic process called "*repression*," (*Verdrängung*.)

It has been directly proved that hysterical symptoms are residues (reminiscences) of impressive incidents, which have been withdrawn from everyday consciousness and are determined in form by details of the traumatic effects of these incidents in a way which excludes voluntary formation. In this conception the therapeutic possibilities consist of the chances of annulling such a "*repression*," so as to allow part of the unconscious psychic life to become conscious and thus deprive it of its pathogenic power. This conception is a dynamic one in so far as it regards the psychic processes as displacements of psychic energy, which can be estimated by the degree of their action on the affective elements. This is most significant in hysteria, where the process of "*conversion*" creates the symptoms by transforming a mental mass of emotion into somatic innervations.

The first psycho-analytic examinations and attempts at treatment were made with the aid of hypnotism. Afterwards this was abandoned and the work performed by the method of "*free association*," the patient remaining in his normal state. This modification had the advantage that the procedure could be applied to a far larger number of cases of hysteria, to other neuroses, and also to healthy individuals. The development of a special faculty of interpretation, however, became necessary, so as to draw conclusions from the expressed ideas of the examined individual. These interpretations established with all certainty the fact that the psychic dissociations are kept up solely by "*inner resistances*." The conclusion, therefore, seems justified, that they have arisen through inner psychic conflict, which has led to the "*repression*" of the underlying emotion. To overcome this conflict and thereby cure the neurosis, the guiding hand of the doctor trained in psycho-analysis is required.

Further, it has been very generally demonstrated that in all neuroses the morbid symptoms are really the end products of such conflicts, which have led to "*repression*" and "*psychic cleavage*." The symptoms are generated by different mechanisms: (a) either as formations in substitution for the repressed forces; or (b) as compromises between the repressing and the repressed forces; or (c) as reaction-formations and securities against the repressed forces.

The investigations were further extended to the conditions under which psychic conflicts lead to "*repression*" (*i.e.*, dissociation caused dynamically), because it goes without saying, that a psychic conflict may in itself have also a normal ending. Psycho-analysis yielded as result, that the conflicts are always between sexual impulses (using the word "*sexual*" in the widest sense), and the wishes and tendencies of the remaining ego. In the neurosis it is the sexual impulses which succumb to "*repression*," and, consequently, form the most important basis for the genesis of symptoms, which, therefore, may be conceived as sexual gratifications in substitution.

Our work on the question of pre-disposition to neurotic affections has added the "*infantile*" factor to the hitherto recognised somatic and hereditary factors. Thus psycho-analysis had to trace back the psychic life of the patients to their early infancy, and the conclusion was arrived at that mental arrests of development (infantilisms) harbour predisposition to the neuroses. We have learnt, particularly from the tracing of the sexual life, that an "*infantile sexuality*" does really exist, that the sexual impulse is made up of many components and passes through a complicated development, the final result of which is, after many restrictions and transformations, the "*normal sexuality*" of the adult. The puzzling perversions of the sexual impulse in adults appear to be either arrests of development, fixations, or one-sided growths. The neurosis is, therefore, the negative of the perversion.

The cultural development forced on mankind is the momentum which renders the restrictions and suppressions of the sexual impulse necessary, greater or lesser sacrifices being demanded according to the individual constitution. Development is hardly ever achieved smoothly, and disturbances may occur on account of the individual constitution or of premature sexual incidents, leaving behind the disposition to future neuroses. Such dispositions may remain harmless, if the life of the adult develops satisfactorily and unpretentiously; but they become pathogenic if the conditions of the mature life deny the gratification of the "*libido*," or make too high demands on its suppression.

From the investigations, which deal with the sexual activity of the child, a further conception of the sexual impulse arises, which is based not on its purposes but on its sources. The sexual impulse possesses in a high degree the faculty of being diverted from its direct sexual goals, and of being led towards higher goals, which are no longer sexual ("*sublimation*"). The impulse is thus enabled to furnish most important contributions to the social and artistic achievements of humanity.

The simultaneous presence of the three momenta—"infantilism," "*sexuality*," and "*repression*"—forms the principal characteristic of the psycho-analytic theory, and marks its difference from other conceptions of morbid psychic life. Psycho-analysis has at the same time demonstrated that between the psychic life of normals, of neurotics and of psychotics there exists no fundamental difference, but only one of degree. The normal individual has to pass through the same "*repressions*," and has to battle with the same substituted or surrogate creations; the difference being only that the normal person performs these processes with less trouble and better success. The psycho-analytic method of examination can, therefore, also be applied to the explanation of normal psychic phenomena, and has made it possible to discover the close relationship between morbid psychic productions and normal creations, such as dreams, the small blunders of everyday life, the valuable attainments of the joke, myths, and poetry. Of these the explanation of the dream is the farthest advanced and results in the following general formula: "*the dream is a deformed fulfilment of a repressed wish*." Dream interpretation has for object: removal of the deformity, which the unconscious thoughts of the dreamer have undergone; also it is a highly valuable aid to psycho-analytic technique, since it constitutes the most convenient method for obtaining insight into unconscious psychic life.

The tendency of contradicting the doctrines of psycho-analysis often occurs in medical and especially in psychiatric circles, without any real study or any practical application. This is due not only to the striking novelty and contrast of the doctrines when compared with those hitherto held by psychiatrists, but also to the fact that the premises and technique of psycho-analysis are much more nearly related to the realm of mind than to that of medicine. It is, however, beyond dispute, that the purely medical and non-psychological teachings have up to now done very little towards the understanding of the psychic life. The progress of psycho-analysis is further retarded by the fear of the average observer to see himself in his own mirror. Scientific men are liable to meet emotional resistances by arguments, and thus satisfy themselves to their own satisfaction! Anyone who does not wish to ignore a truth will do well to distrust his antipathies, and if he wishes to subject the doctrine of psycho-analysis to a critical examination, let him also analyse his own person.

I cannot believe that in these few sentences I have succeeded in painting a distinct picture of the principles and purposes of psycho-analysis, but I append a list of the principal publications on the subject, perusal of which will supply further enlightenment to those whom I have interested.

1. Breuer and Freud. Studien über Hysterie. 1895. Fr. Deuticke, Vienna. A portion of the above has been translated into English in "Selected Papers on Hysteria and other Psycho-neuroses," by Dr. A. A. Brill, New York, 1909.
2. Freud. Drei Abhandlungen zur Sexualtheorie. Vienna. 1905. English translation by Dr. Brill, "Three Contributions to the Sexual Theory." New York, 1910.
3. Freud. Zur Psychopathologie des Alltagslebens. S. Karger, Berlin. 3rd edition, 1910.
4. Freud. Die Traumdeutung. Vienna, 1900. 3rd ed., 1911.
5. Freud. The Origin and Development of Psycho-analysis. Amer. Jour. of Psychology. April, 1910. Also in German: "Ueber Psychoanalyse." Five Lectures given at the Clark University, Worcester, Mass., 1909.
6. Freud. Der Witz und seine Beziehung zum Unbewussten. Vienna, 1905.
7. Freud. Collection of minor papers on the Doctrine of Neuroses. 1893-1906. Vienna, 1906.
8. Idem. A second collection. Vienna, 1909.
9. Hitschmann. Freud's Neurosenlehre. Vienna, 1911.
10. C. G. Jung. Diagnostische Associationsstudien. Two volumes. 1906-1910.
11. C. G. Jung. Über die Psychologie der Dementia Praecox. 1907.
12. Jahrbuch für psycho-analytische und psychopathologische Forschungen, published by E. Bleuler and S. Freud, edited by Jung. Since 1909.
13. Schriften zur angewandten Seelenkunde. Fr. Deuticke, Vienna. Since 1907. Eleven parts, by Freud, Jung, Abraham, Pfister, Rank, Jones, Riklin, Graf, Sadger.
14. Zentralblatt für Psychoanalyse. Edited by A. Adler and W. Stekel. J. Bergmann, Wiesbaden. Since Sept., 1910.

THE DOCTRINES OF THE FREUD SCHOOL.

By HAVELOCK ELLIS, L.S.A. (Lond.).

IN 1895 an unostentatious book quietly appeared in Vienna, entitled, "Studies of Hysteria" ("Studien über Hysterie"), written jointly by two authors, Dr. Josef Breuer and Dr. Sigmund Freud. There was no public ready to receive the book; it attracted little attention, and had a small sale. In England it remained almost altogether unknown, so that it is now a satisfaction to the writer of the present paper to recall that probably the first full exposition in English of the views set forth in this book appeared in the first volume of his own "Studies in the Psychology of Sex," in 1898. Yet these studies of hysteria, as an attentive reader could scarcely fail to realise, turned over a new page in medical psychology, and the new page was of fascinating interest. A case of hysteria was no longer something to be pooh-poohed as beneath a physician's serious attention, nor was it to be settled merely by an accurate description of the physical symptoms, after the manner of Charcot's school (to which school in the first place Freud may be said to have belonged). It was a mystery to be patiently investigated—a mystery to which the key often lay far back and forgotten in the patient's history, and when skilfully used, with knowledge and insight, the patient's medical history acquired not only psychological significance but something of the interest of a novel.

Priority in the inception of the ideas contained in this book, and the treatment based on them, belongs, as Professor Freud has since acknowledged, to the elder writer, Dr. Breuer. After thus opening the road, Breuer disappears from the psycho-analytic scene. Freud, however, undeterred by the absence of sympathy and attention, steadily pursued the promising road thus opened up, constantly reaching new points of view, and soon leaving the standpoint of the first volume behind, so that even yet no finality has been attained in the formulation of his doctrines. After some ten years' work, interest began to be expressed in Freud's work, a demand arose for his books, and some physicians were found who declared themselves his followers. During the past five years this movement has received an enormous impetus. At the present day Freud has many able and enthusiastic adherents, conspicuous among whom is C. J. Jung, of Zurich, who has made the most important addition to Freudian methods. Freud's psycho-analysis is now championed and carried out not only in Austria and in Switzerland, but in the United States, in England, in India, in Canada, and, I doubt not, in Australasia. The profound and universal significance of this new movement in psychopathology was recognised when Freud was invited to the United States to receive the degree of LL.D., at Clark University, and to deliver a course of lectures on psycho-analysis.

Freud's doctrines are so wide-ranging, so novel, so startlingly opposed at many points to accepted beliefs, that they have not only aroused ardent enthusiasm but also bitter hostility and contempt, more especially in Germany. A battle is thus hotly raging round the new school at the present time. But between the two irreconcilable camps there are many who consider that while it is yet impossible to fix Freud's final position in the psycho-pathological field, we certainly owe him a debt of gratitude

for bringing forward new points of view, and that, in any case, we cannot afford to neglect the clues he has furnished in many very obscure fields of research.

Freud's doctrines are so complex that it is not possible to expound them fairly and fully in a few minutes. A brief outline of some of his main positions may perhaps be helpful.

As Freud views the psychological field, the largest and even the most important part of it lies in an unconscious region. A main part of the art of the psycho-pathologist, in Freud's sense, lies in finding the clues to the morbid processes going on in this obscure region, and in bringing them to the conscious surface of life, in which transformation the morbid is rendered normal. This art is, indeed, really the whole of psycho-analysis.

Freud traces back the morbid processes with which he deals—hysteria, obsessions, and so on—to roots in early childhood, to an infantile disposition, and that is largely why they are lost from ordinary view in the unconscious. The later psychic lesions which enter into the causation of hysteria or of obsessions may be highly important, but they are always obscurely connected with a more fundamental, however concealed, lesion or constitutional disposition, which dates from childhood or infancy.

This infantile source of later morbid psychic processes is, in Freud's view, sexual. On infantile sexuality, and on its significance for all later life in morbid cases, he lays very great stress. The child's sexual life he regards as highly complex. It primarily consists in simple tactile pleasures, such as thumb-sucking, friction of the genital, urethral and anal openings, or of other erogenous zones. It develops into a special interest in the activity of the excretory functions, urinary and defæcatory. Extending to other persons, it tends to attach itself, in the boy's case, to his mother, in the girl's case to the father, as well as between brothers and sisters, and it also tends to ignore the adult distinction of sex. "You will not be wrong," Freud says, "in attributing to every child a fragment of homosexual aptitude." These special attractions may easily become special aversions. Fundamentally, however, they are wishes. A sexual wish is, in Freud's theory, at the root of many psychopathic and neuropathic states, which may thus be traced back to disturbances in sexual development.

In the course of the development, however, the crude sexual wish disappears into unconsciousness and is replaced in consciousness by some other manifestation. This is inevitable, for, as the subject grows older, the emotions of shame, disgust, and morality drive the infantile sexual wish out of the conscious field. Fragments, indeed, of this infantile state of desire may in some cases persist in the form of fixed perversions. Perversions are related to neuroses as positive to negative. In the neuroses the same original impulses are at work, but they are working from the unconscious side. Even in the early book of Breuer and Freud many instructive cases were narrated, showing that the painful physical symptoms were really associated with earlier sexual episodes and longings, although the connection was lost to consciousness, and all the intensity of the suppressed emotion had become transferred to the physical symptom. Disease is thus, in Freud's words, a flight from unsatisfying reality into something which, though biologically injurious, is not without

advantage for the patient, for it is a kind of cloister into which, with his transformed infantile longings, the patient retires when deceived by the world, or no longer able to fight against the world.

That is a very abbreviated description of the state of things, as Freud views it, with which the physician has to grapple, and it is a state of things, Freud insists, not qualitatively different from what we may find in normal persons, though it is very much more intensified. The process by which the physician of Freud's school investigates this state of things, by bringing it to the light of consciousness and, in so doing, relieving it, is the famous method of psycho-analysis.

At first, Freud used hypnotism as the method of investigation. He has, however, long since abandoned that method, as capricious and mystical, while in many cases the patients could not be hypnotised at all. He prefers to investigate the patient in the normal state, by what he terms the cathartic method. For a doctor to find out what he is ignorant of by addressing questions to an equally ignorant patient seems unpromising. But Freud remembered that he had seen Bernheim show at Nancy that when a patient appears ignorant of what happened to him in a previous hypnotic state, that ignorance is not really absolute but may with skill be recovered. He found it was the same with the early emotional experiences which lay at the roots of these patients' neuroses. Freud encourages the patient to say everything, however irrelevant or silly, which comes into his head, while he, as it were, stands by and watches these bubbles from the psychic depth, on the look-out for those which furnish a clue to the nature of the process beneath. Jung developed a valuable branch of this psycho-analysis with his method of free association, which consists in reading out a string of words to the patient, telling him to say at once what each word suggests, and noting down the results, in the faith, often verified, that in this way the patient will unconsciously give away secrets that are unknown even to himself. This method Freud regards as the psycho-analytic equivalent of the chemist's qualitative analysis.

As the patient's real history is thus brought to the surface and revealed, slowly and laboriously—and Freud admits that the process is extremely slow and laborious—the patient is enabled to become conscious of the morbid process, and in so doing is greatly assisted in casting it off. In that way the psycho-analytic method is cathartic, and, as Freud himself points out, it is the very reverse of the hypnotic method, for while hypnotism seeks to put something into the patient, psycho-analysis seeks to take something out.

This conception of psycho-analysis was a brilliant idea, for which Freud deserves all credit. It has not, however, been pointed out before to-day, so far as I am aware, that Freud had a forerunner in the idea, though not in its clinical and therapeutical applications. In 1857 Dr. J. J. Garth Wilkinson, a noted Swedenborgian mystic of his time, published a volume of mystic doggerel verse written by what he considered "a new method," the method of "Impression." "A theme is chosen or written down"; he stated, "as soon as this is done, the first impression upon the mind which succeeds the act of writing the title is the beginning of the evolution of that theme, no matter how strange or alien the word or phrase may seem." "The first mental movement, the first word that

comes," is "the response to the mind's desire for the unfolding of the subject." It is continued by the same method, and Garth Wilkinson adds, "I have always found it lead by an infallible instinct into the subject." The method was, as Garth Wilkinson viewed it, a kind of exalted *laissez-faire*, a command to the deepest unconscious instincts to express themselves. Reason and will, he pointed out, are left aside; you trust to "an influx," and the faculties of the mind are "directed to ends they know not of." Garth Wilkinson, it must be clearly understood, although he was a physician, used this method for religious and literary, and never for scientific or medical ends; but it is easy to see that essentially it is the method of psycho-analysis applied to oneself.

Freud also believes that we may apply the method of psycho-analysis to ourselves, and that is, indeed, one of his favourite themes. The self-psycho-analysis advocated by Freud is, however, that of dreams. He holds that the whole process in hysterical and other neurotic subjects may be studied minutely in the dreams of normal persons. "If I were asked," Freud somewhere says, "how one can become a psycho-analyst, I would reply, by the study of his own dreams." The interpretation of dreams is, he believes, the royal road to the knowledge of the unconscious and the firmest foundation of psycho-analysis. The analogy of dreaming to insanity has been known even from ancient times. Freud has argued that the psychic process of dreaming, sometimes at all events, closely resembles that in hysteria and allied morbid conditions; that there are the same sexual wishes, the same repression or censure, resulting in a transformation, and the formation of symbols, the same need for a psycho-analytic interpretation, applied even to the most trivial details in order to make the meaning of the dream clear. Freud's largest and most elaborate work, that to which he perhaps attaches the greatest weight, is his book on the interpretation of dreams.

In considering Freud's conception of hysteria and other allied psychopathological states, we naturally think of Janet, the only other investigator who can claim to be named in comparison with him. There are obvious points of resemblance. Both investigators insist on exclusively psychological interpretations, and both are subtle and elaborate in their interpretations. Both seek the clue in psychic division. But while Janet's dissociational states are founded on a congenital incapacity to reach complete psychic synthesis, Freud explains the psychic opposition dynamically, as a conflict of opposing psychic forces. Moreover, he claims for the process a much wider applicability than Janet has ever claimed for his theory.

Freud has been criticised, it is needless to repeat, from very many points of view. Even among those who accept his doctrine at various points, there are many who will on no account admit that sexual impulses play so large a part in psycho-pathological processes. On this matter, however, Freud firmly maintains his position. He is willing to agree that he uses the word sexuality in a wider sense than is usual, but he affirms that it is necessary to use it in that wide sense. He points, moreover, to the evidence brought forward by Sanford Bell and other psychologists, showing that the sexual emotions, love and jealousy, play a much larger part in the lives of even quite young children than has been usually suspected.

But whatever conclusions we may finally reach in regard to Freud's work, there can be no doubt that that work demands careful study, and that we can no longer afford to pass it by with contemptuous indifference. For the exclusively English-speaking reader, Brill's translation of Freud's "Selected Papers on Hysteria and other Psycho-neuroses" (published in New York), is now available, and there will shortly be an English translation of the new third edition of the book on dreaming. For the German reader, the two fascinating volumes of Freud's "Sammlung kleiner Schriften zur Neurosenlehre" may be specially recommended, while more elaborate material is furnished by the "Jahrbuch für Psycho-analytische Forschungen," of which there are now several volumes, to which Freud and many of his chief followers have contributed. I am myself among those who believe that Freud has shown that in some cases his explanations furnish an adequate account of the facts. But I consider that he generalises too rapidly, and that he too rigidly excludes any explanation of the facts that fails to fall within his own theory. This is especially the case with that portion of the field covered by Freud—the psychology of dreams—to which I happen to have given most careful study. However this may be, Freud has certainly enlarged our horizon and dug deeper into certain psychic fields than any of his predecessors. Like Lombroso, whose theories were often defective and even his facts wrong, it will probably be found that Freud has possessed the magic hand of genius, revivifying all that he touches, and furnishing a new stimulus to investigation for which we can never be too grateful.

ON THE LOCALISATION OF FUNCTION IN THE CEREBELLUM.

By ALFRED W. CAMPBELL, M.D. (Edin.)

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IN this paper I propose to discuss the debated point whether the surface of the cerebellum is divisible into functional areas or centres. Though my own studies in this direction have been mainly histological, I wish to view the question at issue from a general standpoint, including consideration of the findings of workers in other departments of research. First, I would specially refer to a remarkable work on the cerebellum written by Louis Bolk, of Amsterdam, a work which aims at the localisation of function on new grounds, namely, those afforded by studies in comparative anatomy.

Having access to the Zoological Gardens in Amsterdam, Bolk was enabled to obtain a specimen of the cerebellum from almost every species of mammal, and therefrom has compiled a masterful and admirably complete account of the comparative morphology of the organ. He has added some physiological conclusions, which, in connection with my work, are of special interest. He believes, first, that areas or centres exist in the cerebellum; he believes also that these areas or centres are morphologically represented in proportion to the degree in which the animal in the struggle for existence is dependent upon some particular group of muscles or portion of the body. For example, what Bolk regards as the centre for the neck is exceptionally well-represented in the giraffe.

To a fuller understanding of Bolk's conclusions, it will be necessary for me briefly to indicate some points in comparative anatomy. To begin with, it is agreed that the cerebellum is divisible into three lobes—*anterior*, *middle*, and *posterior*—and lateral parts, the *paraflocculus* and *flocculus*. The dividing lines between the three lobes are the *fissura prima* and the *fissura secunda*, and these are the only lobar fissures which are constant throughout the mammalian series. Like these two fissures, the *anterior* and *posterior* lobes also possess great morphological stability. The *middle lobe*, on the contrary, and the *paraflocculi*, but not the *flocculi*, undergo great change. In the *middle lobe* we recognise four parts—a *mesial part*, a *lateral part*, a *pyramis*, and a *parapyramis*. What happens to these in the progress of phylogeny? The *mesial part* remains fixed, but the *lateral part* undergoes enormous expansion, and in *homo* constitutes the major part of each hemisphere. Since this expansion is backwards, outwards and downwards, the *pyramis*, the *parapyramis* and the *paraflocculus* are driven on to the ventral surface, and lose prominence. The *parapyramis* of lower animals becomes the *biventral lobule* of man, and the *paraflocculus* the *amygdala*.

And now, to return to Bolk's physiological conclusions: the *anterior lobe* he regards as a co-ordinating centre for muscle groups pertaining to the head. As justifying this, he points to the stable morphology of the lobe and the restricted evolution of these muscles throughout the animal kingdom. The *anterior folia* of the *middle lobe* he regards as the centre for the neck. He points out that this part is well represented in the giraffe, but he does not satisfactorily explain why the same folia are well represented in man. The central part of the *middle lobe* he regards as a centre for bilateral synergic movements of the extremities, the lateral parts and the *parapyramis* being paired centres for independent movements of the extremities. He asserts that in the ox and all *ungulata*, animals in which the freedom of movement of the peripheral muscles is restricted, the *middle portion* exceeds the lateral in size. In *carnivora*, on the other hand, in burrowing animals and in man, in fact in all animals with independent movements of the extremities, the lateral centre predominates. The *posterior lobe* and the *paraflocculus* he regards as controlling the muscles of the trunk and tail.

Now, assuming that the cerebellum can be divided into areas in this way, it seems reasonable to suppose that the morphological manifestations of specific function will be accompanied by histological manifestations; that notwithstanding the known relative uniformity of structure of the cerebellar cortex, these exceptionally well-developed areas will present some increase in the depth of the cortex, some increase in the size or number of the cells of Purkinje, or some increase in the wealth of the nerve fibres—in short, something indicative of special functional activity.

In the hope, therefore, of finding some such tangible ground for the localisation of function, I have carried out an exhaustive anatomical and histological examination of the cerebellums of the following animals:—The frog, lizard, albatross, turkey, platypus, native-cat, wallaby, rabbit, cat, dog, pig, gorilla, and man. The series is not so comprehensive as one might wish; still it has

afforded sound material for consideration, and here, at the outset, I may say that the results of the examination do not support Bolk's conclusions.

In the time at my disposal it will be impossible to give you a detailed account of my research. I must withhold discussion of details of structure, homologies, variations in nuclear representation, and other points, and confine myself to the selection and presentation in summary form of data bearing on the localisation of function, since this is the chief topic of my paper.

First, I have found that the cortex of the anterior lobe is not so rich as cortex of the middle lobe. In this Bolk might see evidence that the anterior lobe is a special centre, but I prefer to take a different view. I think that this cortex is relatively poor because the lobules it covers are in considerable part marginal—that is to say, on one side there is no support, no conduit for collaterals, no repository for nerve cells as there is in the middle lobe; hence the cortex is not well represented, purely for physical reasons. In other marginal lobules and parts, particularly in the paraflocculus and nodulus, the same obtains.

Secondly, I have found that the cortex of the lobus medius is better represented than cortex elsewhere, but—and this is a point I wish to emphasise—its representation is uniform throughout the entire lobe, equal alike in the middle part, the lateral part, the pyramis, and the parapyramis. Notwithstanding that in the cat and the dog the lateral part is morphologically better represented than the middle part, and that the reverse obtains in the pig, there is absolutely no difference in the cortical structure of the two parts in the respective animals. It has not been my good fortune to obtain and examine the cerebellum of a giraffe, but the wallaby is included in my series, and, in accordance with Bolk's assumption, one would expect to find a specially-endowed tail-centre; but such, so far as I can discover, does not exist. In fact, without going further, I may say that histological examination yields no evidence of centres in the cerebellum.

Turning to other departments of research, we find similar lack of evidence. Take the effects of electrical excitation: here we find conflict of opinion, some maintaining that the cortex of the cerebellum is "silent," others that it is excitable. There are three comparatively recent workers who claim to have found centres by electrical stimulation—Prus, Wersiloff, and Rothmann—but their findings are singularly discordant. Thus, taking the supposed centre for the fore-limb, Wersiloff locates it in the pyramis and posterior lobe, Prus in the anterior folia of the lateral part of the middle lobe, Rothmann in the posterior folia of the same part and in the paraflocculus. They disagree in like manner regarding the localisation of a hind limb centre, and obviously a chart of the cerebellum, showing the excitable points and the corresponding movements assigned by these three observers, would be amazingly contradictory.

These discrepancies are, I think, adequately explained by the very important researches of Clarke and Horsley, researches which go to show that the cortex of the cerebellum is, in the physiological

sense, "silent." In proof of this they have demonstrated, first, that the excitability of the cerebellum, as compared with the cerebrum, is very low. For example, conjugate deviation of the eyes is obtainable by faradising either the cerebellum or the inferior frontal gyrus of the cerebrum; but whereas the inferior frontal gyrus responds to 100 kronecker coil units, more than 2,000 units are needed to excite the cerebellum.

Secondly, in explanation of certain arm movements, specially that resembling the military salute, so often mentioned by other observers, they have demonstrated that the application of a hyper-maximal stimulus (4,000-8,000 units) causes the trapezial group of muscles to contract, and the contraction proceeds with increasing force as the electrodes are brought towards the edge of the fourth ventricle, and lower still to the neighbourhood of the spinal accessory nerve. Hence they conclude that this contraction is an "escape phenomenon," and not, as others suppose, evidence of cerebellar function.

Lastly, they have demonstrated that the intrinsic nuclei of the cerebellum and the paracerebellar nuclei are the real receivers of applied stimuli. By an ingeniously contrived apparatus, they have succeeded in confining the effect of the electrical current to any desired nucleus, and they have found that all, or nearly all, the movements obtained by others from cortical stimulation may be elicited from the nuclei; moreover, the excitability of the nuclei is exceedingly high, 10 units producing movements, as compared with the more than 2,000 units required for the cortex. A further point of importance to be mentioned in this connection is that it has been shown that not a single axone from a Purkinje cell directly gains any of the cerebellar peduncles; all pass to cells of the intrinsic nuclei. These nuclei, therefore, must be collectors for impulses arising in the cortex.

Next, let us consider the effects of experimental destructive lesions in lower animals and natural lesions in man. So far as I can gather, there are only three experimenters—Van Rijnberk, Rothmann, and Lourié—who maintain that focal destruction of cerebellar cortex is followed by motor disablement. Careful perusal of their writings, however, forces me to believe that the effects they describe were due to destruction, not of the cortex, but of the subjacent intrinsic nuclei; indeed, one of them (Rothmann) specifically mentions that the lesions he made were so deep as to include the nuclei. Other experimenters—and there have been many—have not found the cerebellum responsive to small cortical injury.

Not only does an impartial consideration of the results of experimental destruction seem to negative the existence of centres in the cerebellar cortex, but clinical evidence points in the same direction. I think there is no clinician who will not admit that a confident decision as to the side on which a tumour of the cerebellum may lie can never be given unless there be either intrinsic symptoms, such as cranial nerve paralysis, or general symptoms, such as hemiataxia. If it be difficult to decide in which hemisphere a lesion is situated, how much more difficult must it be to locate the part of the hemisphere? This would not be so if centres existed.

Of course, in this consideration we are concerned with the function of the cortex of the cerebellum, and the destructive effects of a tumour—the commonest cerebellar lesion met with in practice—are seldom sufficiently circumscribed to be of value in physiological considerations. The effects of arterial occlusion are more definite, and may closely approach those of an experimental lesion. Of such occlusions I have notes in fifteen cases, the resulting destruction by softening affecting various parts in the distribution of the superior and inferior cerebellar arteries. These cases have yielded no evidence of the existence of centres; indeed, in most the softening has been attended by no symptoms. Add to this the experience of modern surgery. Given a suspected tumour in the cerebello-pontine angle: in order that a complete view of the parts may be obtained, some operators, after exposing the cerebellum, do not hesitate to excise a portion of the hemisphere. The tissue removed is part of the semilunar lobules (homologous with the lateral part of the middle lobe); but although the excision may exaggerate pre-existent homolateral ataxia, it does not specially produce brachial ataxia.

I cannot close without reference to the effects of destruction of the vermis or central part of the middle lobe. Risien Russell and Ferrier and Turner alike found that extirpation of the vermis in animals produced the general symptoms of removal of the whole organ. In the human subject corresponding observations have been made. Apart from the common observation of bilateral symptoms in cases of lesion of the vermian region, there is the clinical study of Hughlings Jackson and Risien Russell of a case of cyst of the middle lobe which formed the basis for the statement that this part must be a centre for, at any rate, the trunk, because its destruction causes weakness of trunk muscles specially.

But here again the recent work of Horsley and his collaborators stands in the way. They have shown unequivocally that limited cortical lesions, as well as cortical stimulation, are resultless, and that the subjacent nuclei, on the other hand, are not only highly excitable, but their excitation has for effect those movements which result in the well-known Jacksonian cerebellar attitude. Considering the proximity of the intrinsic nuclei to the "vermis," the thought immediately comes to mind that the effects of a tumour, or an ablation, or any other lesion of the vermian region, are ascribable, not to cortical destruction, but to coincident pressure upon, or irritation of, or other interference with the subjacent nuclei. Histology also, in showing no structural difference between vermian and lateral cortex, joins in suggesting that it is wrong to establish the middle lobe on a pinnacle of physiological eminence. There is a strong and growing likelihood that the intrinsic symptoms of a cerebellar lesion are directly proportionate to the degree of involvement of the intrinsic nuclei.

My conclusion, therefore, from an impartial consideration of all the evidence, is that the surface of the cerebellum cannot be cut up into functional territories. I would subscribe to the belief that the cortex of the cerebellum subserves a function which is sensory in kind. I would regard it as a general receiving station for impressions from muscles, bones, and joints, and from the vestibulum. It

is my belief that these impressions are not delivered at special stations, but are diffusely distributed in the cortex of each homolateral hemisphere. From the cortex these impressions are transferred to the intrinsic nuclei, from which efferent tracts lead to other parts of the nervous system, and thence again to the muscles, &c. So a great reflex arc is completed, the function of which is to regulate and co-ordinate movement.

PROFESSOR WILSON asked Dr. Campbell in what light he regarded the localised distribution within the cerebellum of the fibres of the spino-cerebellar tracts, ventral and dorsal? It was generally held that the fibres of these tracts ended predominantly, if not exclusively, within the cortical area of the worm, and that therefore the afferent impulses conveyed by these fibres would seem to be poured into a more or less definitely localised cortical area, which would thus be in some broad sense associated with the trunk and limbs.

Dr. CAMPBELL, in replying, said that he was glad Professor Wilson had put his question, because it was a very important one, and the supposed termination of the spino-cerebellar tracts in the vermis called for explanation. In this connection, Dr. Campbell pointed out that while many, especially those who had experimented on lower animals, accepted this termination, it was not a general belief. There were others who held as firmly that these tracts were distributed over the cortex of all parts of the cerebellum. Since these divergent views existed—probably on account of the difficulty both of producing perfect degeneration of the tracts and of following the fibres histologically—and since further research on the point was needed, Dr. Campbell had purposely omitted reference to the matter in his paper.

SIGNIFICANCE OF THE BABINSKI REFLEX.

By GEORGE E. RENNIE, M.D. (Lond.), F.R.C.P. (Lond.), Sydney.

THE phenomenon of extension of the big toe as a response to stimulation of the sole of the foot, which is met with in certain morbid conditions of the nervous system in adults, was first noticed by Babinski in 1898, and later was fully investigated and described by Collier at Queen's-square Hospital, London.

At first the greatest emphasis was laid upon this change in the response from flexor to extensor as a most valuable discovery of a definite sign whereby organic disease could be for certain differentiated from functional, and it was firmly maintained that the presence of the Babinski reflex was an undoubted proof of the existence of some organic disease in some part of the pyramidal tract.

So definite and striking a phenomenon naturally became the subject of much investigation by neurologists all over the world, and it was not long before statements were made which tended to throw doubt upon the phenomenon as being a certain differential sign of organic from functional disease. Cases were quoted in which the

Babinski reflex was present where it ought not to have been—that is, where there was no other sign nor evidence of organic nerve-disease; and it was absent when, according to the working hypothesis, it should have been present. As a result of this criticism, the value of this reflex has been lowered in the eyes of some who have not troubled to investigate the matter for themselves, nor to arrive at any explanation of these apparent deviations from the rule formulated by Babinski and others.

In a normal condition of the adult nervous system, stimulation of the sole of the foot—in other words, of the termination of the first sacral nerve-root—results in a flexion of all the toes, and inversion of the foot, and this appears to be a simple reflex, an extension of the stimulus from the afferent sensory to the efferent motor tract.

But it is not always a simple response, for we know that frequently the stimulus spreads, and not only excites the flexors of the toes and the invertors of the foot, but also the muscles of the thigh, especially the tensor vaginae femoris, and this is more frequently noted in cases of active response to the plantar stimulation.

Why the excitation of afferent responses from the sole of the foot, in cases where there exists some morbid condition of the pyramidal tract, should result in a stimulation of the extensor muscles of the toes, especially of the hallux and the evertors of the foot, is a matter which awaits explanation, though it is significant—as pointed out by previous writers—that the extensor response is the normal condition of the plantar reflex in the anthropoid apes, and in young children before they begin to walk.

Another phenomenon which rather adds to the difficulty of the explanation is that of the crossed plantar reflex. In some cases of hemiplegia, as pointed out by Dr. Byron Bramwell, stimulation of the sole of the foot on the paralysed side will result in the usual extensor response; but if the stimulus be applied to the sole of the foot on the healthy side there will be a flexor response in the paralysed side also. These variations in the responses to plantar stimulation in different conditions certainly suggest that the plantar reflex is not so simple as it appears. Otherwise, why should some abnormal condition of the pyramidal tract lead to such a striking alteration in the reflex response?

In the use which has been made of this reflex action in the differentiation between organic and functional nerve disease, it has been assumed that the organic disease is situated in the pyramidal tract, and that the occurrence of the Babinski reflex shows the existence of some organic disease of these tracts. Now, further investigation of those conditions under which the extensor response occurs, will show that the existence of permanent organic disease of the pyramidal tract is not a *sine qua non* for its occurrence; and that a mere temporary interference with the conduction of impulses along them, or with their origin in the brain, is sufficient to determine the occurrence of the Babinski reflex; and since this is so, it is thus possible to explain the discrepancies which have existed in the reports of different observers, as to the existence or not of this phenomenon, in cases of functional nerve disease.

But I would go a step further. Many years ago, Dr. Seymour Sharkey, of St. Thomas' Hospital, London, in his lectures before the Royal College of Physicians, pointed out that the exaggeration of the deep reflexes was always due to pressure upon the **pyramidal tract**; and that one never observed the exaggerated knee jerks and ankle clonus of organic disease unless this morbid condition of the great motor tract was present.

I believe that this generalisation of Sharkey's still holds true, for the occurrence of the Babinski reflex; and this is not surprising at first sight, when we consider the frequency with which the Babinski reflex is associated with exaggeration of the deep reflexes.

I will quote two cases to illustrate the factor that pressure on the pyramidal tract—which may be temporary only—is sufficient to determine the alteration from flexor to extensor responses in the plantar reflexes.

The first case was one of hydatid cyst of the left frontal region of the brain in a boy 14 years of age, which I reported in the *Australian Medical Gazette* several years ago. In this case the clinical symptoms and signs of cerebral tumor had existed for some twelve months before I saw him, and all the signs pointed to an hydatid cyst in the left frontal region. There was no definite hemiplegia or paraplegia, but a general weakness in all the limbs. But a striking feature was the well-marked Babinski reflex obtained on both sides. This was a constant feature of the case, and was noted when he was placed on the operation table, and after the chloroform narcosis had become complete. After trephining, the cyst was aspirated, and about 4 ounces of hydatid fluid were withdrawn. On testing the plantar reflex after this was done, it was noticed that the extensor response had become flexor. Nothing further was done at this stage, and the wound was stitched up. The removal of the fluid and the relief of tension not only gave relief to the subjective symptoms, but the plantar reflex continued to show flexor response for some days, until, in fact, the refilling of the cyst led to a recurrence of the symptoms, and again the plantar reflex became extensor in type. Subsequent operation, with removal of the fluid and cyst wall, again led to a flexor type of plantar reflex.

Now, this case, I think, conclusively shows that increased intracranial pressure alone can determine the occurrence of the Babinski reflex; but whether that pressure must be in such a position as to cause direct compression of the pyramidal tracts in their course in the pons and medulla through the foramen magnum (and this would seem more probable from the fact that the response was bilaterally extensor), or upon their radiation in the centrum ovale, it is impossible to decide from this case alone.

But what I want to emphasise is: that this case shows that—as the immediate result of relief of pressure on the pyramidal tract or on the brain—a well-defined double Babinski reflex can be converted into a normal flexor response, provided, of course, that the pyramidal tracts are not themselves the seat of organic change.

The second case was a girl, 16 years of age, with a strong tubercular family history, who was admitted in the Royal Prince Alfred Hospital under my care some years ago. She complained of pain in the back and in both legs, and an examination showed exaggerated reflexes and double Babinski reflex on both sides. She became, rather rapidly, completely paraplegic, with loss of control of sphincters and loss of the deep reflexes, though the Babinski was retained feebly. Examination of the spine with X-rays was negative, but lumbar puncture resulted in the withdrawal of some cms. of fluid under pressure, which, however, showed no tubercle bacilli, and was sterile. The result of the puncture was remarkable, for in a very short time she recovered the use of her legs, control over the sphincters, and the exaggeration of the reflexes, and the Babinski reflex disappeared. She walked out of the hospital unaided, and has reported herself well on several occasions since.

Here, then, is another case in which relief of pressure on the spinal cord resulted in a change of type of the plantar reflex from extensor to flexor.

This latter case might be regarded by some as one of hysterical paraplegia, and be used as proof that the Babinski reflex does occur at times in purely functional cases. Quite apart, however, from the question of the plantar reflex, I am convinced that this was not a case of hysterical paraplegia, for the whole history of the patient, the mode of onset, its progress to a complete paraplegia with loss of sphincter control, and the recovery which ensued—only after relief of pressure on the cord by lumbar puncture—pointed conclusively to some organic disease; but the subsequent progress of the case showed that she was not suffering from any permanent organic change in the pyramidal tract.

I will quote another case of different type, which again shows that the Babinski reflex may be a well-marked temporary phenomenon.

Some years ago I was asked to see a boy of 14 years of age who had a bad neurotic family history, and who himself had been subject to headache, apparently of the type of migraine. He had left his home in the morning with a headache, and had gone to his work in the city. Shortly afterwards he was found in a cellar at his place of work apparently unconscious, and paralysed. He was taken home, was seen by a local doctor, who, later in the day, asked me to see him in consultation. Suffice it to say that this boy presented all the phenomena of right-sided hemiplegia with aphasia, with a Babinski reflex on that side. Further inquiry into his past history revealed the fact that he had had a previous similar attack. On the strength of the history of migraine, and the probability that this was another migraine attack, I gave a favourable prognosis. I saw him again three days later, when the whole condition had practically cleared up; his Babinski reflex had disappeared, and his reflexes were normal. Here again, though recovery was complete in a very short time, there can be no doubt that there was some temporary organic change in the brain (whatever the nature of it may have been), causing pressure on the pyramidal tract. Whether or not he

had some underlying organic disease, such as a tumor or cyst, is beside the question at present. I quote the case as a further illustration of my contention that a Babinski reflex may be a merely temporary condition, and, therefore, not significant of permanent organic nerve disease.

If, then, we realise that the Babinski phenomenon may be a temporary one, associated with some alteration in the physical condition of brain or spinal cord—sufficient to induce pressure upon the pyramidal tracts, or some interference with the conduction of impulses along them—we shall be able to estimate the true significance of this reflex. Whether, in an individual case, it points to temporary or permanent organic disease must be determined by the other features of the case and its progress.

KORSSAKOW'S DISEASE.

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IT is now some twenty years since the late Professor Korssakow, of Moscow, first published, at the International Congress of Mental Medicine, Paris, his description of the syndrome with which his name is now inseparably associated under the title of "Polyneuritic Psychosis," and subsequently, "Cerebropathia Psychica Toxæmica."

Prior to this, various Continental and English writers had recorded cases of multiple neuritis of alcoholic origin, accompanied by mental confusion and amnesic conditions of a peculiar character, viz., a tendency of the patient not only to forget actual occurrences, but to imagine he remembered events which had never happened to him.

Korssakow, however, seems to have been the first to have established the relationship of the mental symptoms with the neuritis, and to have assembled the whole as a disease entity.

Since then, many monographs and essays have been written, and some hundreds of cases have been reported by Continental and American alienists and neurologists; but the presence of literature on the subject by English observers is somewhat strangely infrequent, and I can find practically no reports on this highly interesting and by no means rare disease in the magazines and journals of this part of the world.

I propose to append a number of cases, more or less typical, which have come under my observation in the Receiving House, Melbourne, during the past year or two, which illustrate the special features of the syndrome; and it may be that on reflection some of those present may, like myself, recall cases in their experience, before the disease met with the recognition it now obtains, which we possibly classed as alcoholic dementia, or, again, others under the convenient title of "pseudo-general paralysis."

In Korssakow's earlier publications, he postulated three cardinal features, viz., multiple degenerative neuritis, amnesia, and pseudo-remiscences, and that all these symptoms were the united expression of a toxæmia, chiefly, but not essentially, due to chronic alcoholism.

Since Korssakow's time the accumulation of the cases recorded and the observations of more recent investigators have added very greatly to our knowledge of this symptom-complex, and some additional symptoms have been included, so that now we have, in the presence of certain cardinal symptoms which are essential, a clearly outlined mental picture of the disease.

Symptoms.

Before describing the symptoms in detail, it may be mentioned that for a considerable time it was a debatable point whether the contention of Korssakow was correct, that polyneuritis was an essential accompaniment of the special psychic aberration as described by him. Such authorities as Babinski and Bonhöffer have cited cases throwing doubt on this question, but "the matter rested on the decision of the criteria necessary to prove the existence of the multiple neuritis in a case,—*criteri*a which varied considerably according to the opinion of the individual observer. Recent knowledge of morbid anatomy suggests that neuritis may be looked for in any case of Korssakow's disease, and its absence in certain cases may be accounted for only by the fact that the morbid process has failed to include the neurons of the grey matter of the cord and of the posterior root ganglia."—Ascherson (1).

The fact that the patellar reflexes may be exaggerated instead of diminished does not necessarily exclude the existence of neuritis, as Turner (2) has examined the posterior tibial nerves in a case of peripheral neuritis with very exaggerated knee jerks, and found very marked degeneration present.

Consequently the disease must be regarded not merely as a psychosis but an affection of the entire nervous system, in which the physical symptoms bear as important a relationship to it as do the mental symptoms.

The onset of the disease may be sudden or gradual, the former being the more frequent. Often the disease begins with an attack of delirium tremens, from which the patient emerges with the typical amnesia, paramnesia, and disorientation fully developed.

Kräpelin, Bonhöffer, Cole, and others hold the view that Korssakow's disease and delirium tremens are very closely allied, if not actually different forms of the same disease. Frequently, at night, in the course of the malady, one finds in Korssakow's disease a delirious condition with hallucinations, even though the patient is quite otherwise in the daytime.

Some even describe the disease as a form of chronic alcoholic delirium.

In one of the appended cases the disease was apparently ushered in by a mild "stroke."

At times, especially where the onset is gradual, certain prodromata may be noticed—a lack of attention to work, indifference to appearance, and a partial failure of memory and irritability.

Multiple neuritis, as the name of the psychosis indicates, is the prominent physical symptom of the disease. The neuritis may precede or accompany the mental symptoms; less often it follows it. The presence of the neuritis is exhibited by deep tenderness in the muscles of the extremities, with tremor and weakness in the extensors, especially

of the hands and feet; and diminished knee jerks, with alteration of cutaneous sensibility. Pain on pressure over the course of the main nerve trunks is usually obtainable.

Quinquaud's sign—a curious crepitation caused by the vibration of the phalangeal joints, when the fingers rest on the palm of the observer, and frequently observed in alcoholics—is sometimes of value as corroborative evidence in obscure cases.

Together with the disturbance of the functions of the peripheral nerves, we meet almost invariably, in greater or less degree, with symptoms indicating the presence of affections of the cranial nerves, such as oculo-motor paralyses, sluggishness of the pupils, and facial paresis, especially diminution of the naso-labial fold; cardiac neuritis—shown by feeble, irregular, rapid, and intermittent pulsation; and diaphragmatic paralysis.

With regard to the pupils, a sluggish reaction is most often met with, at times merely a restricted range to light-reaction and frequently an inequality of the pupils; but the important feature of these conditions is that they are transitory. Although a pupil of the Argyle Robertson type may sometimes be found, it is never constant, and should always lead to a suspicion of tabes dorsalis or general paralysis.—Ascherson (1).

Speech disturbances may occasionally be met with, particularly some forms of aphasia. Amnesic aphasia, complicated with paraphasia, was observed in one of the cases reported herewith. Usually the aphasia is transient.

Korssakow (3) describes certain general physical symptoms such as debility, vomiting, and diarrhoea, and suppression of the menstrual functions. I have observed one or other of these conditions in nearly all the cases I have seen.

In very severe cases, the exhaustion and emaciation is rapid; the patient sinks into a prostrated state, with dry tongue, flickering pulse, low tension, and a typhoidal state ending in death. Case III illustrates this termination.

Mott, "Archives of Neurology," (4) has pointed out that an advanced grade of cirrhosis of the liver is seldom met with in Korssakow's disease, though the liver is sometimes considerably enlarged, smooth and firm to the touch, and anatomically shows considerable fatty change, and an early stage of multilobular cirrhosis.

Mental symptoms.—There are certain cardinal symptoms which Korssakow insisted on as essential to the existence of the disease. These are amnesia, pseudo-remiscences, and confabulations, disorientation, mental confusion. Besides these, there is another almost invariable condition, viz., hyper-suggestibility.

In addition there are found certain subsidiary mental symptoms, such as hallucinosis (aural and visual illusions or hallucinations), certain anomalies of mood, and delusions of a certain type.

The peculiar amnesic condition is one of the most striking features of this psychosis. Although the memory for events of early life and circumstances up to the onset of the illness is usually fairly exact, that for the immediate past and current events is extremely defective.

Conversations of a few moments ago are forgotten even to have occurred. Identities are forgotten as rapidly as they are made. New impressions fail to be retained in any way. The memory defect has

been well described by Ascherson as due to a failure in mental synthesis. There is no steadily progressive forgetting of facts in the order of their recency of acquisition, such as obtains in organic disease of the brain. On the contrary, there may be a variation in the degree of amnesia from day to day; or there may be oases in the desert of forgetfulness, the patient remembering a number of events, while totally forgetting all others correlated to them.

It is usual to find such a patient giving several different replies from hour to hour, on being questioned as to the duration of his stay in his present abode.

Pseudo-reminiscences, if associated with an alcoholic history, are regarded by most authors as an essential feature, if not pathognomonic, of Korssakow's disease; this condition (paramnesia) is in effect a memory hallucination, or illusion, as the case may be. In this state the patient will give a narrative apparently coherent and truthful in which actual facts and events are mixed up with imaginary ones.

These patients, when entirely confined to bed, will relate long walks which they imagine they have just taken, describing minutely the people they met, places visited, and conversations held. It is remarkable how frequently in this disease one meets this particular falsification of memory—the taking of long walks at night or morning.

Usually the subjects of this disease have some considerable degree of insight into their mental shortcomings and amnesia, and will confabulate to bridge over the awkward gaps in their defective memory. It is important to observe, however, that these pseudo-reminiscences and confabulations are never improbable or grotesque, and might reasonably have happened. In this respect they differ from the grandiose exaggerations and absurdities in other forms of mental disorder, such as G.P.I. It is noteworthy how frequently women subjects of this disease exhibit the false memory of a baby having been in bed with them the previous night. Several observers have drawn attention to the frequency with which this occurs.

Another very common pseudo-reminiscence is that of a patient recognising a room or locality in which he may find himself for the first time as one with which he is very familiar, and has many times previously occupied. The writer has observed this in nearly all cases.

Mental confusion is found in a large number of cases at one or other period of the psychosis. The sense of recognition may be very much disturbed. There is very often complete disorientation of time, place, and identity. "The disorientation is peculiar in that the patient's interpretation is always made to fit some scene of his past life—a scene usually connected with the performance of his professional or usual duties, and that persons present are mistaken for those who took a part in it."—Ascherson (1).

A frequently observed and characteristic symptom is that of *hyper-suggestibility*. The patients are exceedingly credulous, and can be easily influenced by suggestion, however temporary the acceptance of that suggestion may be. In most of my cases, I have found this so. The train of thought can be directed into whatever channel is desired.

As a rule, the attention of the patient can be easily engaged, but it cannot always be held except with difficulty; there is always an air of abstraction, a degree of *apathy* that is unmistakable.

The emotional condition is very variable. At times there is depression, but it is always governed by the character of the memory hallucinations, and as this is continually changing, the depression is rarely continuous. Generally, however, these patients are placid, or facile, cheerful or jocular, sometimes euphoric; but, whatever the mood, there is usually an underlying condition of irritability.

At night, the restlessness, peevishness, and sleeplessness is often very marked; and, when hallucinations occur, considerable excitement is manifested. Nearly all cases of Korssakow's disease are much worse at night time.

The hallucinations when present are usually visual and tactile; less often they are auditory. At first they only occur at night, and apparently are merely a part of the delirium. They usually take the form of living objects, animals, insects, and so on (zoopsia), and the creeping of vermin and reptiles on the skin, and they assume various extraordinary and fantastic characteristics so familiar in delirium of alcohol. These sensory disturbances, particularly the tactile, appear to depend on the peripheral neuritis and oculo-motor disturbances, and might more properly be regarded as illusions.

Auditory hallucinations are occasionally encountered, and are usually of a terrifying character, suggesting the destruction or maltreatment of the patient, and causing great apprehensiveness. Persecutory delusions and delusion of marital infidelity, and of food being tampered with, are the forms usually found in this disease.

The most important feature of these hallucinations and delusions is their indefinite duration and transient nature. They rarely become systematised.

Etiology.

At one time considerable discussion arose as to whether any case of Korssakow's disease could be regarded as independent of chronic alcoholism. The disease is undoubtedly due to a toxæmia; and in practically all cases the toxic agent is alcohol. In such event it is only found in cases of long continued drinking, where the habit is often not discovered until after the onset of the disease. So far it has not been my experience to observe a case of Korssakow's disease due to causes other than alcohol; but cases have been recorded as due to pulmonary tuberculosis, acute fevers, sepsis, anæmia, carcinoma, syphilis, and arsenic and lead poisoning.

In the cases investigated by Ascherson, nearly 85 per cent. were due to alcohol, and he points out that a more searching investigation into the histories of the non-alcoholic cases would probably reveal an unsuspected chronic alcoholism.

It may occur at all ages from 20 years upwards, but midlife is the most usual period.

It is said to be more frequent in women than men, and statistics seem to bear out this view. May this not be due to the fact that women are more often of the type of quiet steady drinkers, who seem more prone to the disease than the intermittent alcoholics? Are women less resistant to the effects of alcohol?

Diagnosis.

Perhaps the disease most likely to be confused with the one under consideration is general paralysis, and the resemblance between the two conditions is more marked when the dementia supervening on Korssakow's disease shows itself. In both diseases we have alterations of facial expression, ocular symptoms, speech disturbances, and impairment of tendon reflexes. In general paralysis, however, amnesia is steadily progressive; it is defective for remote events, and follows Ribot's law. The disorientation which is complete in Korssakow's disease is only partial in general paralysis.

The grandiose nature of the delusions or pseudo-reminiscences and their bizarre and absurd character also help to distinguish general paralysis from this disease.

In addition, the mental disturbance and confusion, as well as the foregoing conditions, are of a transient nature in the alcoholic psychosis.

In some cases of Korssakow's disease affecting old people with arterio sclerosis there is a close similarity to senile dementia. Here, however, we do not usually find indications of multiple neuritis. There is, moreover, progressive deterioration of the intellect, childish emotionalism, poverty of idea, and marked egotism.—Wehrung, 1908 (5).

Finally, there is, as Serbsky has indicated, a condition in this disease which distinguishes it from those most resembling it, viz., that the character and personality of the patient do not undergo alteration.

Certain functional psychoses, when dependent on alcoholism—hysteria, neurasthenia, and epilepsy—have conditions in common with Korssakow's disease, but show more marked diminution of consciousness; the memory defects differ in character, and there is greater confusion.

Prognosis.

While a number of cases apparently recover completely, the prognosis generally must be regarded as unfavourable. Most writers affirm that in almost all cases some degree of memory defect remains permanently. With this I cannot wholly agree.

The course of the disease is usually prolonged, sometimes for years before recovery; but in some cases is limited to a few weeks. Perhaps the average duration is about six months. Many end in complete dementia, especially those of long duration, or those who return to alcoholic habits. Death occasionally takes place in the delirious stage from exhaustion, or some intercurrent organic disease.

Pathology and Pathogenesis.

From the researches and evidence available it seems clear that in Korssakow's disease, alcohol does not act directly on the nerve centres, but that the changes observed are due to some form of toxæmia. According to Gilbert Ballet (7) and Dupre (6) the condition is one of auto-intoxication arising from inadequacy of the hepatic function, the result of the action of alcohol on the liver, producing fatty changes in the cells, especially if associated with renal disease. Others, again, regard the gastro-intestinal disorder as the *nisus generativus* of the disease. Wehrung (5) holds the view that habitual alcoholising causes the production of an anti-body, which, from one cause or another, may be in excess of the alcohol which its function is to neutralise, and can then exercise its toxic action on the nervous system.

As to whether the specific action of the toxins effects the change primarily on the terminations of the cell-processes, or directly on the nerve cells themselves, there is a diversity of opinion.

The French writers have found degenerative changes in the cells without any atrophy of the tangential fibres. S. Cole (8), who has made an exhaustive histological examination of the nervous system in cases of alcoholic insanity, to some extent agrees with this opinion, as he considers that, although the neuritic lesion is a degeneration of the nerve fibre, and not an inflammatory condition, the toxins indirectly produced by alcohol impair the whole neuron, leading first to decay of its remotest parts.

Turner (2) and some of the German writers hold to the view that the nerve fibres of specially susceptible cell-bodies are primarily affected, and that any lesions in the cells themselves—which are by no means characteristic or constant—are produced subsequently.

Dr. Mott (4), at Claybury, has investigated the condition of the cortical cells, in cases of polyneuritic psychosis, and found in the pyramidal cells, and especially in the large Betz cells, “disappearance of the Nissl granules except at the periphery of the cell, swelling of the cell, and eccentric displacement of the large and clear nucleus.” In advanced cases some of the cells were found to have lost their processes, the nucleus was extruded from the cell through its broken and crumpled membrane, and the nucleoli had disappeared. His view is that the changes described “have a physical origin and are due to a transudation of lymph causing an increase of their fluid contents—an œdema of the cells—brought about in the same way by impaired osmosis, as uræmic poisons cause the œdema of renal disease.” If this view is correct, one can conceive the varying intensity of the mental symptoms and their evanescence or complete disappearance, and that unless or until the degeneration of the cells or tangential fibres is reached, the symptoms are merely the result of disordered function.

In acute cases where death takes place in the early stage, a condition of hæmorrhagic polio-encephalitis may be found.

Treatment.

Little need be said on this subject, as the treatment is primarily symptomatic. The widespread nature of the neuritis has to be considered, especially in the severe cases, affecting not merely the nerves, but also the viscera. Prolonged rest and isolation are obviously indicated in cases even where exhaustion is not immediately manifested. Complete withdrawal of alcohol, except in special instances of emergency, is essential. Liquid nourishment, especially milk, in abundance and frequently administered, should be the rule. Salines for the gastrointestinal disturbances are probably to be preferred to calomel. For the sleeplessness, which is often troublesome, paraldehyde combined with bromides and digitalis in full doses is most effectual. I have found this combination exceedingly useful and reliable, even in cases where paraldehyde or bromides uncombined have failed. The urine should be carefully watched for evidences of renal complications. For the neuritis, in addition to general measures, hot applications locally, or ice bags, warm packs, massage, or electricity may be advisable.

In the later stages I have found the hypodermic administration of strychnia, alone, or combined with atropine in graduated doses, advantageous.

Convalescence is dealt with on ordinary principles, but it is found that these patients are rarely capable of sustained effort, mental or physical, even when apparently quite well, for a considerable period.

A proportion of cases can be treated no doubt in private hospitals, or even in their homes, but the great majority of patients—where mental symptoms are predominant—are so anti-social that separation from the community is necessary, and treatment must be carried out in an institution for the insane, or, in some instances, where the memory defect is the chief alienating feature, in inebriate institutions.

In the cases which follow, I am indebted for some of the notes to Dr. R. S. Callander, Medical Officer, Receiving House, Melbourne.

CASE NO. I. A CLASSICAL CASE OF KORSSAKOW'S DISEASE.

A.D. Admission, 7th January, 1911. Female. 50 years. Married (3rd husband). No children. Duration of illness prior to admission, five weeks. Medical certificates state:—Complete change in personal appearance; conversation incoherent; dirty and untidy; said she had only recently arrived at her house (she had been in it for twenty-five years). Delusions about people, long dead, coming to visit her. Fits of violence, smashes furniture and windows. Wanders aimlessly about the street; does not go to bed at night.

On admission.—Face wears a curious puzzled expression. Memory for recent events very defective; thinks this month (January) is July; does not remember seeing me yesterday; nor with whom she came here. On being told she is in the Receiving House she forgets in a minute and asks where she is. Can tell her age early family history, and events of former married life. Has no perception of her, altered mental state. Agitated and noisy last night. Always asking for her jewellery, clothing, &c., which she thinks she brought here (not so). Believes she brought them in a portmanteau.

10th January, 1911. Is still agitated about her jewellery; said she came here at 11 a.m. to-day and that I was Dr. M. of Richmond who attended her outside. Feels quite well and wants to go home. Shows pseudo-reminiscences, thus wonders where the rings are which she had yesterday, imaginary visits from her friends; that she went for a walk this morning to Melbourne, called on friends and had breakfast with them. Describes an imaginary meal there; says she has lived in this house last year and remembers quite well all the furniture and people, also that she has often been here. (All this is false).

Physically.—She shows the malar venous dilatations of the alcoholic as well as the facies. There is a positive history of alcoholism over a long period, steady nipping with occasional outbreaks. Urine slightly albuminous.

16th January, 1911.—Her memory for old events is remarkably acute. She can relate experiences in England and France in great detail (which turn out quite correct). She states Hastings was her birthplace, that she lived in All Saint's-street, stayed at a hotel in Regent-street before coming to Australia; was married three times; and gives all the details of her life with each husband—all of which are correct. At the same time she cannot give the name of the bank in which her husband is at present employed, nor his position there. Does not know she has been drinking at all. She is very suggestible, and any suggestion, almost, will be realised. Thus when she was told she had been engaged in a round of amusements last night, she described the theatre she believed she went to; also a supper party and the names of the people there, &c. Again, on being shown a humorous cartoon, a serious description of it was given to her, and the patient gave a solemn and serious version of it.

Patient is very restless and wanders aimlessly about. Her gait is unsteady; there is some slight "Romberg," she shows marked tremor of hands, tingling of extremities, absence of patellar reflexes, and pain on pressure over main nerve trunks. Her handwriting shows typical tremor also. Complains of pain in calf muscles.

26th January, 1911.—She is not greatly altered. Talkative and restless at night, getting up at all hours and knocking at the door. This restlessness is not apparent in the day time, and she has no memory of the night disturbances. She thinks now she is in gaol, but has been on a trip and this is an interlude in it. Her perception is unaffected, however, and she can name flowers, and everyday objects, knowledge of which has not recently been acquired.

5th February, 1911.—Memory defects and pseudo-reminiscences still very evident. She cannot say what she had for the previous meal except one or two articles at times. Believes she came here last night for the first time. Does not know name of place, but thinks it is for people of weak intellect. Supposes she is here on account of weak memory. Does not remember ever having seen me before, although I had only left her ten minutes previously; but knows I am a doctor; disorientated entirely as to time and place. Said that between breakfast and dinner to-day she had walked along a road somewhere and renewed her acquaintance with the locality.

6th February, 1911.—To-day on being asked if she was away anywhere yesterday she pointed to a building opposite and said she went there by herself, and became agitated over having done wrong (as she believed). Declared she did not know she was doing wrong. Asked what she did in that building, she said "a nurse came and talked to me there for a long time."

10th February, 1911.—Physically, much improved though the facial vascular patches are very conspicuous. The gait is steadier now; there is no "Romberg"; the deep reflexes are not entirely absent now but very diminished. When admitted she could not walk without assistance. Now she rambles about unassisted. Most of the signs of neuritis have disappeared. Suggestibility very evident to-day. At suggestion she agreed she had been among the gardens last night and on the road had visited the houses opposite; met me and others and held conversations with us. When told she had not been out, she looked puzzled and said "Oh, was not I really?" On being shown a picture of Jack and the Beanstalk she admired it and read it aloud, and on the book being taken away, she could not name the picture she had just seen.

She still exhibits a considerable degree of apathy. Her attention is very easily aroused and can be held as long as one is inclined to converse, especially about matters concerning her life before the mental break-down. At the same time there is some irritability occasionally shown.

29th May, 1911.—Memory still markedly defective. Is less suggestible now. Still unable to remember the most recent events even. Continually asks the nurses about her jewels and looks for them. Is still unable to fix the day or date and, if told, forgets it the next minute. At the same time her insight into her condition is very decided, thus, she will take pencil notes of the things she is likely to be asked (getting the information from the other patients), such as dates, places, identity &c., and then glancing at them before replying. Neuritis almost absent now. Gait steady. No "Romberg." Always asking "can I go home to-morrow," and being quite satisfied with the answer "yes," although it is repeated daily.

30th August, 1911.—Although no neuritis can be detected now, the mental condition is unchanged, except that there is now no desire to volunteer confabulations. Expression still very puzzled. (Still under observation.)

Remarks.

This case is a typical "Korssakow," the onset being somewhat gradual; the neuritis being well marked at first and steadily disappearing, but the mental symptoms being stationary over a period of nine months. Practically all the cardinal symptoms are present. The prognosis is now a slowly developing dementia; she is unable to dress herself now as she does not know which article of clothing to put on first or their sequence.

Other cases omitted owing to want of space.

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FATIGUE.

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RECENT writers have extended the meaning of the term "fatigue" until now it embraces many conditions relating to the body as a whole, or to parts of the body, in which certain phenomena occur. The width of meaning now given to the term can best be measured by concrete examples.

A muscle, or set of muscles, frequently exercised within a short period show at the end of a certain time an inability to perform the task which was at first comparatively easy. Referring to this enfeebled condition, we speak of it as fatigue. Such muscles, under the conditions already named, may, however, be the seat of a feeling of tiredness, and this feeling itself is often called fatigue. A muscle fatigued in the first sense has its power of contraction diminished by an accumulation of fatigue products, removing of these products terminating the fatigued condition. In this way muscular fatigue is not "a phenomenon of deficit," but is protective, as it causes a cessation of activity before exhaustion or dissolution sets in. That the katabolic products of muscular action, under normal circumstances, protect the integrity of the muscle cannot be regarded as a fortuitous circumstance. We are apt to forget that the muscle-unit has made use of a means at its disposal for a definite end. This it has done by a process of adaptation of which more will be said later. One more fact needs to be stated. Muscles fatigued by voluntary effort can be recalled into activity by electrical stimulation. Another set of activating factors has broken down the former resistance, and motor reactions again manifest themselves. Somewhat analogous phenomena are seen during the activity of nervous tissues. Prolonged and severe mental effort produces a sense of weariness referred to the neighbourhood of the central nervous system. Excessive over-stimulation, as is seen in shock, causes great diminution of nervous activities. It is a common experience that fatigue-inertia of the nervous system can be broken through by bringing into play a new set of stimuli differing from that set responsible for the fatigued condition. The feeling of weariness, and the need for sleep, often melt under the heat of great excitement. Similar examples might be multiplied.

Fatigue of muscle is brought about by accumulation of waste products in the muscle substance, but we are led to suppose that analogous nervous inactivity from over-stimulation owes its occurrence to a different mechanism. It would seem that over-exercised nerve cells have a power of diminishing their functional activity by interposing resistances at their synaptic junctions. Here also, then, nervous fatigue is not "a phenomenon of deficit." The occurrence of such resistances would go far towards explaining many nerve conditions—traumatic psychoses, for example. Concerning spinal shock in experimental transection of the cord, Professor Sherrington says:—"The conditions of the spinal reflex-arcs in spinal shock appear to resemble a general spinal fatigue rather than an inhibition. It renders difficult and uncertain the process of conduction along the

reflex-arc as judged by the discharge from the terminal neurone. This suggests a loosening of nexus between the links of the neurone-chain comprising the arc—a defect of transmission at the synapse.”

The relation of fatigue phenomena in the central nervous system with synaptic resistances, and the relation of these with mental diseases, is what we desire to deal with on the present occasion. An endeavour will be made to show that over-stimulation occurs under certain conditions, and how this over-stimulation leads to fatigue resistance, and this in its turn to pathological manifestations. If what follows seems lengthy or prolix the apparent importance of the subject must stand as the excuse. For a brief period attention must be directed to the unit of activity, the cell.

The summation of all vital phenomena constitutes life. Vital phenomena, for the most part, represent the reactions of the units to stimulation. When it seems impossible to account for the reactions by changes of external conditions, we speak of these reactions as spontaneous; but the closer the inspection the fewer these spontaneous reactions become. Vital manifestations, then, essentially represent phenomena of stimulation. Stimulation implies a stimulus and a vital unit reacting to that stimulus.

The life of the cell represents a balancing adjustment to its environment. The environment supplies certain conditions necessary for the maintenance of life—e.g., food, heat, light, &c. The conditions may vary within limits without terminating the life of the cell, but there is a degree of each vital condition at which the life thrives best, this degree being known as the Optimum. We know that a certain temperature, for instance, is best suited to a certain cell. This temperature may be exceeded or decreased within limits without destroying the life of the cell. The extremes of the limits are the maximum and minimum of this particular condition. The optimum, then, represents a balancing point, where, so to speak, the life processes are in a state of equilibrium to the forces acting upon them. Regarding these forces as stimuli, corresponding to the optimum of the vital conditions, these stimuli have their minimum of unstabilising effect; in other words, have reached their zero point. Any departure from this zero point tends to upset the vital equilibrium, and the further the departure the greater the effect, till at last complete overthrow may ensue—that is, death may take place. The intensities of stimuli thus have a minimum corresponding to the optimum of vital conditions, and on each side of this point two maxima. A certain temperature is necessary for life, but excessive heat or excessive cold kills. These considerations apply to other conditions, “like certain chemical and electrical stimuli,” which, “under normal circumstances, do not come into relation with the organism at all. The intensity of these latter varieties, considered as a vital condition, is zero—in other words, the complete lack of them corresponds to the optimum. They can therefore have but one maximum. . . .”—(Verworn.) Cognate to the subject of fatigue is the fact that over-stimulation may ensue without alteration in the intensity of the ordinary stimuli. It will now be shown how this may take place.

With alteration in the character of the vital unit, the optimum of any vital condition may become displaced in its former relation to

the minimum and maximum of that vital condition. This involves a simultaneous departure of the zero point of the intensity of stimulation. If the stimuli have remained unchanged, they must now become in excess of the requirements of the changed unit, and there is a relative increase in intensity. In this way a nerve cell which, through disease or degenerative changes, has lowered the optimum of its vital conditions renders itself liable to over-stimulation by stimuli which formerly were best suited to its vitality. The greater the departure of this optimum point towards the minimum limit the greater becomes the over-stimulation by the ordinary environmental stimuli. This seems to be the principle underlying those cases where breakdown occurs from the ordinary stress of life and conditions of civilisation. This condition of excessive stimulation, due to lowered vitality, might be considered a factor in many bodily diseases, and it is only necessary to mention a possible connection with such divergent conditions as malignancy and renal and arterial diseases to indicate a wide possibility of application.

Over-stimulation of a vital unit within limits already indicated may evoke two conditions which must be looked upon as protective reactions. The first is Resistance; the other is Adaptation. The operation of these can best be seen without complicating factors in such a simple cell as an amoeba. An amoeba subjected to excessive stimulation withdraws its pseudopodia and assumes a globular form. In this way it attempts to place itself furthest from all possible points of over-stimulation. It has interposed a resistance constituted by distance. In organisms higher than amoeba, where there is a formation of a calcareous protecting wall, evolutionary progress has brought about a more complex form of resistance. Again, an amoeba, by gradual additions of a chemical salt to the medium in which it is living, can be brought to exist in a salt solution of such a strength as would have been fatal to its life if it had been suddenly immersed in it without time for a gradual process of adaptation. The process of adaptation implies a response depending on the vitality and reactional integrity of the cell. With a diminishing vitality, such as we will assume in certain mental diseases, such a response would become less and less, till there came a time when the only protection from over-stimulation would be the interposition of resistance. Moreover, in the process of evolution protection by resistance must have been of primary manifestation and in order of development antecedent to the more complex reaction of adaptation. We would expect it then to be more stable, and the last factor of protection to be lost in a gradual process of vital decay.

If these facts hold good for simple units, much more would they seem to apply to the more highly organised cells of multicellular organisms. Adaptive response to a certain degree of over-stimulation represents the effects of education in its widest sense, and is also responsible for trophic increases, lack of response owing to extrinsic and intrinsic deprivations bringing about the atrophy of disuse.

Thus we have seen that lowered vitality of the unit means possible over-stimulation from the ordinary environmental stimuli. Vitality lowered beyond a certain point means loss of adaptive power. Without resistance, over-stimulation calls forth over-activity, to be

followed by exhaustion and dissolution. Resistance may come into play, however, as a protective measure in the struggle to survive. Resistance may be so energetic a restraining factor, as in spinal shock, that it comes to have a pathological significance. As a factor resulting from over-stimulation, resistance becomes synonymous with fatigue.

In certain mental diseases we are led to assume that there is a failure in the vitality in the elements of nervous tissue. In such a condition as senile dementia there appears to be a general lowering of vitality. In hysteria and the allied conditions localised areas of weakness in the psychic regions appear, and the new clinical method psycho-analysis would seem to be a means of discovering these spots of psychic fatigue. Dementia præcox belongs to another order. The signs and symptoms of this disease indicate that there is a degenerative change in the highest centres, which spread downwards, in various degrees, in different cases in the reverse order to which the nervous system has been evolved. Hurler, years ago, pointed out that the highest centres were the least organised and the most unstable, and the lower centres most organised and most stable. We know that the action of such a drug as alcohol indicates this; that in poisonous doses it appears to paralyse the nervous system in the inverse order to its development. If we consider the gravest degree of alienation seen in dementia præcox we are led to the conclusion that an individual so affected resembles a being from which the highest controlling centres have suffered ablation—a being pathologically decerebrate. Evidence, however, adduced from the examination of the brains of those who have been so affected fails to show sufficient gross organic change to account for the intensity of the symptoms displayed. But if we assume degenerative lowering of vitality and over-stimulation from environmental stimuli, the findings in dementia præcox can be explained. Over-stimulation may lead to over-activity of the cells affected, with, perhaps, exhaustion supervening. Such a result we see in katatonic excitement. With the development of resistances there would be a diminution of activity. In the earliest stages of the disease it seems possible that the two phenomena of over-activity and diminution of activity might take place at the same time in different localities in the areas affected, or that there might be a period when resistances were only partly established. Results of such mixed reactions are seen in katatonic excitement, where excessive mental and motor activities seem associated with partial restraints. This feature serves to distinguish the disease from acute mania.

But it is rather with the condition in which great resistances come into play that we must now concern ourselves. The mechanism of a resistance to nervous action cannot be dealt with here. It is not necessary to assume an extensive block in synaptic transmission to account for grave mental abnormalities. Elimination of centripetal stimuli at one point on their afferent paths may cause striking defects. "Langendorff has pointed out that a blinded frog resembles in its reactions a frog with the cerebrum removed; the elasmobranch without its olfactory lobe behaves as if it has lost its fore-brain."—(Sherrington.)

We will assume, then, as the result of over-stimulation of the nature already described, there results a widespread protective reaction constituted by the interposition of synaptic resistances, which remove the highest centres from their sphere of action. The individual will then react to his environment independently of the action of his chief cerebral centres. He will lose his highest psychical attributes, lose dominance over the lower orders of nervous reaction, and there will be freed those formerly restrained atavistic tendencies which remain as evolutionary landmarks, and which are kept in control, under normal circumstances, by the over-rule of the more highly-developed attributes.

It is characteristic of dementia præcox that the perceptive faculties seem less affected than the executive. It might reasonably be supposed that, phylogenetically, perception preceded execution; that perception is more stable, and occupies a lower cerebral plane than the ability to react co-ordinately. In the cerebral cortex there must be ascending degrees of perception, progressing upward from the sub-psychical to those parts where, from a stimulus impressing itself, the greatest psychical elaboration takes place. It is the capacity for this greatest elaboration that is lost in the disease being considered. A recognisable minimum of perceptive power always remains and stands in prominent relief against the dull background of executive incapacity.

It is the loss of centrifugal impulses, however, that causes the marked condition of alienation in dementia præcox. This loss makes the individual "decerebrate," and accounts for such symptoms as catatonic rigidity, negativism, stereotypy, &c. The brilliant expositions of Professor Sherrington bring a new light to bear many obscure nervous phenomena, and frequent extracts from "Integrative Action of the Nervous System" will be made to afford authoritative support in what is to follow. Catatonic rigidity resembles in many respects decerebrate rigidity. The muscles affected are those which function to maintain the body in the erect posture. Like decerebrate rigidity, it appears to be a continuous extensor spasm, due to removal of control of the cerebral centres and to reflex stimulation from the muscles themselves in association with labyrinthine stimuli. Other points of similarity are that the spasm can be maintained without fatigue for long periods, that any effort to remove the parts affected from their pose elicits considerable resistance, and that vertical posture brings about the rigidity. Patients suffering from catatonic rigidity show some relief from the spasm when they lie down. It is also significant that the catatonically rigid individual, like the decerebrate animal, shows no emotional reaction indicative of pleasure. Negativism is the reaction from stimuli, which might be harmful. Probably all stimuli are potentially harmful, and regarded by the organism as obnoxious till they are subjected to analysis by the higher cerebral centres. We instinctively start back from a sudden sensory stimulus which takes us unawares, a stimulus which acts through a short reflex-arc before it can be referred to the cerebral cortex along a headward path.

We have been told that in the decerebrate animal all noci-ceptive reactions tend to the type associated with escape or attack. Those who have been closely associated with mental disease, in which deprivation of the higher cerebral centres might reasonably be supposed, know that these types of reaction frequently present themselves. The shrinking away of those suffering from catatonic rigidity, from close approach and from actual contact, is often observed. "In decerebrate rigidity, where a tonic reflex is maintaining contraction in the extensor muscle of the knee, stimulation of the noci-ceptive arcs of the limb easily breaks down that reflex. The noci-ceptive reflex dominates the motor neurone previously held in activity by the postural reflex." This quotation, in relation to the statement immediately preceding it, is significant, as is also the following to those acquainted with the unreasoning antagonism of the negativistic:—"When a noci-ceptor is stimulated in the right side of the tail of the spinal dog or cat or lizard the reaction moves the organ to the left." We are led to believe that the noci-ceptive mechanism is stable, and suffers relatively lightly in spinal shock. Thus we see that a protective provision survives severe interference with the action of the central nervous system, and that when the conscious phenomena are lost instinctive reactions may still be left.

In like manner stereotypy can be explained by the removal of cerebral influences. Stereotypy is a mixture of automatism and actions not directed by the purposive influence of the will. Similar actions are seen in pigeons and rabbits from which the cerebrum has been removed. These actions sometimes simulate to a marked degree complex cortically-controlled movements. Observation of the "mannerisms" of dementia præcox indicates that they are what might be called "the pantomime of natural emotion," not the emotion of the completely cerebrate being, but the emotion of a being of a lower order. In the human child and in the lower animals the ever-changing play of the emotions calls forth motor manifestations. As humans develop from the period of infancy, and become more cerebral, these motor manifestations are repressed; ideation becoming the equivalent. We see the practical jokes of the youth being replaced, in the man, by the less energetic enjoyment of more subtle incongruities. Contrariwise, if the human by disease or other circumstances becomes less cerebral the coarser emotions become indicated by their motor accompaniments, till, with a deep descent from a high cerebral level, atavistic tendencies show themselves. The monkey tricks develop.

Similar laying bare of ancestral traits and reversions to anterior types of conduct would account for the peculiar impulse to wander, resulting in the "fugue" of the dementia præcox sufferer. This flight, from the concomitant signs, would appear to arise from a sexual stimulus taking its origin in the strong proprio-ceptive field of the sexual organs. This impulse affects those at an age when such sexual stimuli are strong, when metabolism is being directed into reproductive channels. The flight of birds at the nesting season, the swarming exodus of bees and ants at breeding time, are associated with sexual impulses. Primitive man, probably, was compelled to seize his mate by force, and in flight seek safety. Even to-day antenuptial observances include "walking-out" and journeys

to secluded spots. The culminating flight is the honeymoon, which probably could be traced back to some ancestral action arising out of expediency. Underlying these seemingly trivial occurrences there would appear to be a vestige of that which at one time in our history was a necessity. With the removal of higher control and consciousness, unperceived sexual impulses awake a slumbering instinct, and the impelled being makes a flight, unable to understand the cause or to ever know the intended end of the journey. The path along which he has come leads nowhere, and he is lost. In milder forms of dementia præcox, and in the earlier stages of the severer forms, there is often found a vague hallucinatory condition. To explain this we might suppose that perception only reached a lower psychical level, and in consequence lacked a perfect elaboration. When the cerebral centres are normally becoming inactive, as at the approach of sleep, such phenomena appear, and the hypnagogic hallucinations of the half-somnolent state are not uncommon. The false sense-perceptions of dementia præcox are not unlike these hypnagogic hallucinations. Dementia præcox presents many degrees of abnormality, varying from what might be called a mild degree of mental inertia to the severest forms of catatonic rigidity, in which the vital reactions seem to originate in the lower organic centres of the nervous system, a condition so grave in its psychical aspects that the sufferer comes to resemble a decerebrate unit. In the milder forms of the disease the patient is often able to recognise a block in his nervous reactions. One fairly intelligent patient recently under observation thus described his state in writing:—“Conditions and circumstances seem to show that throughout my life have had a slight nervousness which, while of no great drawback, still shows to me that a slight nervous stress hinders the just appreciation of the actual conditions one may be living in, and induces states of feeling, whilst not abnormal, still hinder the natural and easy working of adjusting oneself to environments that are respected. Nervous symptoms also indicate a slight temporary irritability under conditions of excitement or otherwise, such as a slight inability to articulate properly and evenly. . . .”

The fairly rapid onset of dementia præcox, the recoverability of a small percentage of cases, the intermission and remission of symptoms of another small percentage, the noteworthy absence of the discovery of gross histological changes to account for so serious a condition, and the absence of indications of a much-disordered metabolism, all point to a functional origin of the disease rather than to an organic one. The nature of this functional origin has already been indicated. The very few histological changes found could be accounted for by an atrophy of disuse.

Dementia præcox owes its origin, then, to degeneration; its symptoms to fatigue in the special sense earlier described; the fatigue to over-stimulation by environmental stimuli; over-stimulation arising from lowered vitality. Thus the cycle is complete.

A few words in conclusion. It will have been seen that in these considerations mental diseases, in as far as they have been dealt with, have been regarded from the physical viewpoint. It is recognised that some few mental disease conditions are mainly psychical in manifestation and in origin, but even in these the underlying

physical phenomena cannot be neglected. To do so makes the admission that mind is an entity able to exist independent of its intimate physical associations. Lugaro, in "Modern Problems of Psychiatry," says:—"An extraordinary importance has always been attached to psychic causes in the genesis of insanity. But this importance becomes restricted, and in fact much diminished, if not altogether dissipated, when an attempt is made to explain the mechanism of their action. . . . We may not . . . speak of a psychic origin of a disease, but of special symptoms, of particular episodes."

At the present time attention seems to be strongly focussed on the psychical aspect of insanity and allied conditions, somewhat to the neglect of the physical. Though not strictly applicable to the matter under present review, yet the implied direction for future guidance contained in the following quotation of Sherrington might be made use of:—"A practical inference . . . is that physiology and psychology, instead of prosecuting their studies, as some now recommend, more strictly apart one from the other than at present, will find it serviceable for each to give to the results achieved by the other even closer heed than has been customary hitherto."

A consideration of the relation of fatigue to other mental and nervous diseases cannot be further dealt with here. The few suggestions already given must suffice.

DEMENTIA PRÆCOX AND ITS PROPHYLAXIS.

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HAVING had an interest in this psychosis, I have ventured, not without hesitation, to submit this paper, in which I propose to deal mainly with the pre-dementia præcox phase. An investigation of the histories of many cases shows that there is often a long period prior to the development of the definite psychosis, a period presenting certain characteristic signs, the significance of which, however, has been overlooked, and the recognition of which may have led to the taking of such measures as would have diminished the liability, if not prevented the development of the psychosis. We have all heard it asked if this was not Nature's method of getting rid of the unfit, but who is to decide this question as to fitness, especially when we pause to consider how many illustrious members of our race have been near the border-line of insanity.

Many are the victims of our civilisation, others of the neglect of the all-important years of puberty and adolescence, and of the absence of any scientific study of pedagogy. It is essential that these weaklings be early recognised, and receive special attention from their earliest years, and that the school teacher, who often sees the first signs of impending trouble, evidence of pathological fatigue, realises its significance, so that the child may be educated more in the playground than in the school.

Conception of Dementia Præcox.

There is no unanimity of opinion among alienists regarding this. Kraepelin has done our science a great service in the recognition of this entity, with its characteristic symptoms, course and prognosis, although the account of its pathology is exceedingly vague, yet we are coming to the conclusion now that the original sub-types proposed by him are inadequate, the hebephrenic, catatonic, and paranoid, and that the conception requires extension. It is recognised that some cases of manic-depressive insanity do not escape a certain kind of deterioration, and cases of a cyclical type, formerly confused with folie circulaire are now recognised as belonging to the dementia præcox group, as also cases of a depressed type even with delusions of sinning and unworthiness, in which group, however, there is seen a certain emotional deterioration, want of relation between the ideation and the prevailing emotional state, stereotypy in speech and writing, and occasional outbursts of excitement, with silly laughter and pantomimic actions, and although suicidal attempts may have been made, they are often of a bizarre character. In others there are delusions of a hypochondriacal sort, but their silliness and the accompanying emotional tone stamps their basis.

I have recently had under observation a case of dementia præcox of the circular type, thought at first to be a case of circular insanity, and briefly, showing the phase of excitement with silly rhyming, pantomimic gesture, negativism, followed by a period of stupor, with negativism, dirty habits, and then a period in which she was fairly rational, though the memory for the events preceding was defective. Here, then, there was no true flight of ideas, nor real depression.

The conception of dementia præcox is associated with the names of Hecker, Pick-Kahlbaum, and in its more elaborated form Kraepelin and Jung. The justification for the formulation of this disease-entity has given rise to a good deal of discussion, but I think its value is becoming more and more recognised, the introduction of prognostic principles being a distinct advance, and increasing knowledge will enable us to apply these principles with better understanding. It may be regarded as indicating certain characteristic features, "the oddity, unnaturalness and incongruity of the entire picture in the face of relative clearness, the tendency to turn on definite complexes, especially in spheres difficult of adjustment, evidence of dissociation and paranoid tendencies," the conduct apparently not being based on definite motives such as we find in other types of mental disorder, where there is an obvious psychological basis in ideational, effective, sensory or memory disturbances.

In different cases we see different degrees of breakdown in the cerebral mechanism, so that there may result a delirious state, or stuporose condition of acute development, or where from certain conditions of the psychic constitution, suitable reconstruction can occur without such profound results on the personality, catatonic, hebephrenic or paranoid features then prevailing.

Prognosis.

The diagnosis of dementia præcox means for some a hopeless prognosis, since they regard the disorder as essentially deteriorative. For others, however, there is still the possibility of an individual prognosis, and I believe experience supports their contention. Some cases recover rapidly, and may remain free from further attacks, providing the environment is suitably adapted; others recover after some months or years; whilst in others, again, there are more or less frequent recurrences, recovery not infrequently involving some permanent mental enfeeblement, so that the patient sinks to a lower psychic level, or the one attack may end in irreparable dementia.

The prognosis will be influenced by the degree of involvement of the fundamental instincts, by the mental make-up of the individual, the nature of the complexes, and the justification or otherwise for the dissociation of the mental processes and paranoid tendencies.

The following case shows the tendency to recurrences:—

M.S., female, æt. 35, single, described as temperate in habits, engaged in house duties at home. Has always been of a quiet, religious disposition. An engagement occurred at 23 years, which was broken off, and this led to mental trouble, characterised by laughing and crying, and inability to do anything. She recovered after three months. She has always suffered from dysmenorrhea, the flow being very slight, and usually lasting less than a day. For this she was operated on, but without getting relief.

She remained well till four years ago, when an illegitimate child was born. Owing to the shame and to the father not providing for it, another attack occurred, in which the chief symptoms were talkativeness, laughing, crying, singing, great restlessness, insomnia, and destructiveness. She recovered after fourteen days. She was admitted to the Receiving House on 28th December, 1910, having during the previous week refused food, stripped off her clothing and tore it, exposed herself, changed in her affections towards and struck at her mother and sister, putting on her night-dress to go to the beach. On admittance she was resistive, negativistic in speech and action, refusing food, very destructive, noisy, and untidy. Was much improved in a week, and was discharged recovered in a month.

The father drank heavily at the time of her mother's conception.

14/8/1911. Readmitted to R.H., being impulsive, destructive, careless of personal appearance, and cannot control dreamy states.

Pathogenesis.

Here we find two schools of thought, the one regarding the disorder as essentially organic, even to the extent of comparing it with parietic dementia, the other—functionalist—as a dissociation of the mental processes. I cannot think that it is to be regarded as essentially organic, though it may have an organic basis.

Evidence of gross pathological lesions has been brought forward by Southard, who found gross lesions (cerebral) in 68 per cent., or including microscopical, in 86 per cent., and attempted a classification based on the distribution of the macro-pathological lesions into—

- (1) Pre-Rolandic group with a sub-group of paranoid trend.
- (2) Post-Rolandic group with a sub-group in which catatonic features are common.
- (3) Infra-Sylvian group.
- (4) Cerebellar group with catatonic symptoms.

Alzheimer has shown that there is a distinct gliosis of the deeper layers of the cerebral cortex. Mott has also shown the existence of organic changes, affecting both the neuroglia and the neurones themselves.

Toxæmia has been postulated, and even hypothetical toxins of a specific nature accepted on quite insufficient grounds. Hyperthyroidism, abnormal states of the sexual glands and hæmic states have done service, and we find partial thyroidectomy practised, but these prove of little use in the interpretation of the facts before us.

Pughini has shown that in the acute stage there is increased destruction of the phosphorus and sulphur-containing proteins, and in the later stage, decreased destruction and postulates an auto-intoxication. Koch and Mann have demonstrated from a chemical examination of the brain of dementia præcox cases, that there is a diminution of neutral sulphur, compared with brains from normal persons and those from cases of other types of mental disease, and consider this as probably indicating diminished oxidation processes.

Sometimes there is evidence of preceding exogenous intoxication, as from typhoid, dengue, influenza, &c., but these cases are so comparatively rare, that they may be dismissed. All that we are justified in assuming, then, is a disorder in the balance between anabolism and katabolism—essentially an endogenous disorder. It is not to be considered, however, that psychogenic dynamism plays no rôle, for it and the psycho-biological aspect offers a more satisfactory explanation of the phenomena. Considering the psychogenic mechanism, the study of which we owe to the genius of Freud, we find that the sensory disturbances, silly delusions, and bizarre actions have a definite mechanism and psychological explanation. Here we have to consider the constant struggle between the complexes, which are in harmony with, and those antagonistic to, the main trends of the personality. Normally, adjustment occurs

through repressing influences and adjustment reactions; where, however, there is a defect in these modes of adjustment, so that the balance between the opposing complex-groups is disturbed, then there is manifested thinking and acting obviously abnormal. Dealing briefly with the mechanism, we may recognise certain definite factors. Prominent comes the wish fulfilment, generally in the domain of sexuality, which is usually presented to the conscious personality in a distorted form, so that even the patient does not recognise its real nature, *e.g.*, sexual feelings are called electrical influences, or it may be manifested in the direction of religiousness. This may also lead to sensory disturbances, so that the patient has an hallucination of her lover visiting her at night, or complains of interference at night whilst asleep, or again finds the object of her longings in different people, this leading to the diffuseness of the sexual instinct which is so characteristic.

The negativistic mechanism may also be similarly explained, for here there is the shunning of all that tends to rouse the underlying complexes into activity, and this may go even to the extent of the so-called negativistic stupor. It is then nothing less than a protective mechanism.

In the paranoid forms there is yet another type of compensation in the association of ideas of persecution with the incompatible sexual-complexes. Atonement and substitutive methods of compensation have also been recognised, in order that the incompatible complexes may be presented to the conscious personality. Hoch has recently dealt with these different factors.

Heredity plays an important part in this condition, as is seen from the following accounts. According to Kraepelin 7 per cent. show a definite hereditary taint, and in 17·18 per cent. the immediate ancestors are involved. Clouston also refers to the marked influence of heredity in the insanity of this period, in this direction of mental defect or neuroses. Pickett has supplied an analysis of the hereditary factors in 58 cases of dementia præcox, including 30 hebephrenics, 11 katatonics, and 17 paranoids. Of the hebephrenics he found direct mental heredity, including alcoholism, in 17, insanity in the parents of 7, nervous disease (unstated) in 3, apoplexy in 2, and alcoholism in 5.

In 11 katatonics, direct mental heredity in 6, insanity in the father or mother in 3, and in a sister in 1 case.

In the paranoids, direct heredity was found in 10, the parents being involved in 4.

Tanzi finds that among the ancestors of those who suffer from this form of insanity, that the mothers are insane, hysterical or peculiar more often than the fathers, and declared that of all mental diseases, dementia præcox is the one most distinctly hereditary. This opinion is shared by other psychiatrists, *e.g.*, Vorster, who showed in a study that all the families with dementia præcox in the ascendants had dementia præcox in the descendants.

Jelliffe in a contribution has pointed out three elements most important in the ancestry of cases that have been followed for years—dementia præcox itself, alcohol and abnormal personality, or crankiness, and lays stress on a class, which he calls the “derelicts,” probably dementia præcox coming on later in life, and slight in degree.

On going over the cases admitted to the Receiving House, I have found but poor evidence of hereditary factors, and therefore any statistics drawn from this source would be unsatisfactory, since there is no record of conditions like crankiness, eccentricity, or alcoholism.

Of ten cases where the hereditary factors have been definitely investigated, the following results have been ascertained:—

Hebephrenics—6 cases.

Father a G.P.I. (one case).

A brother mental years ago; sister insane (in two cases).

Alcoholism (paternal) } Two cases.
Antisocial conduct }

Father and father's ancestors neurotic (one case).

Catatronics—9 cases.

Father or mother demented, mother melancholic (three cases).
In the latter, insanity in maternal brothers and paternal sisters (two cases).

Parents first cousins, with insanity in antecedents, and sister epileptic (one case).

Brother and aunt insane (one case).

Alcoholism, paternal (one case).

In one of the cases in which the mother was demented, there was phthisis on the mother's side, paternal syphilis, and three children showed evidence of dementia præcox.

Paranoids—4 cases.

Alcoholism—paternal—in one case with insanity in aunt, brother alcoholic in another (two cases).

Paternal eccentricity, marital incompatibility, maternal “hysteria” (two cases).

Sandy has collected 68 cases (43 males and 25 females), with hereditary influences in 17 (13 males and 4 females) *i.e.*, 25 per cent.

Twelve out of the seventeen cases had relatives who were designated as neurotic, defective, peculiar, queer, or having the same psychosis. In seven there was no psychosis, only the peculiarity of eccentricity. Alcoholism in the family history was quite common. If these be added to the cases showing insanity or peculiarity, the total percentage of heredity is 36·76.

The influence of phthisis in the production of the dementia præcox syndrome is being dealt with by Dr. Catarinich. In my own cases I have found it not infrequently.

Here, then, the psychopathic constitution of the individual plays an important part—a complex of factors, which yet remains to be determined. Granted the possession of this, we find that such causes as love troubles, overwork, worry, anxiety, fright, shock, excitement, trauma, suffice to bring the dementia præcox syndrome into existence.

One factor in this abnormal constitution, I think, is an abnormal state of the synapses. Now the important experiments of Sherrington have directed our attention to the important part played by the synapses, and McDougall has shown the protective action of fatigue in increasing the resistance at the synapse. In the pre-dementia præcox stage pathological tire is an important symptom, that is, fatigue which does not pass off with the usual resting period, and the syndrome frequently develops on a neurasthenic basis, the patient complaining of weariness, lack of attention, inability to follow his usual occupation, paræsthesiæ thinness, muscular weakness, insomnia, frequent yawning, and he shows the physical accompaniments of exhaustion, sometimes with the manifestations of psychasthenia, such as phobias, obsessions, impulses.

So that we may be dealing here with imperfect physico-chemical changes, at the synaptic junctions, failing to regulate the resistances there, the reserve store of energy in the cell becoming exhausted, and the cell-protoplasm itself disintegrated.

It will now be my aim to present some features of the material out of which this psychosis arises. Before doing this, however, it will be necessary to devote a little attention to the psychic traits of puberty and adolescence, of the sudden expansion of the personality that characterises this period.

Hall has pointed out that “this age has often been characterised as that of mental and moral inebriation and psychic madness, and all its symptoms can be paralleled in the inner and outer life of youth, who do not lapse towards the terminal imbecility, but develop to sane and efficient maturity.”

There is an expansion of the individuality, of over-assertion of the ego, great ambition, so that we find the adolescent devoting a good deal of time to the remedying of the world's ills, or fancying himself a great man with new truths for humanity; over-confidence in his abilities, and excessive pride, vanity, great attention to the personal appearance may be observed, and in these we may find the germs of the thoughts of superiority, even insane conceits, impudence, and undue irritability.

Imagination, too, dominates the mind, and every wish tends to realisation, ideas of fame and greatness prevail, along with various illusions. Reveries and dream states may occur, self-absorption, wool-gathering, so that the outer environments fails to supply its normal stimulus.

There is an exaggeration of self-consciousness, self-criticism, and self-renunciation, with ideas of being watched, suspiciousness, and furtiveness. so that a condition of solitariness with unsociability

arises, and we find the individual shunning company, showing some hopeless indefinable yearning, communing with stars and moon, fancying himself hated by everyone, and being involved in great internal struggles concerning human destiny, profound stirrings of the soul, anxiety about doing right carried so far that indecision results, secret religious doubts often of great intensity, so that much energy that should be devoted to action is squandered in these internal struggles.

We may find abject superstition, vanity in regard to the personal appearance, and sudden importance of the care of the person. Ecstatic states, *e.g.*, on wandering in the woods and fields, may be noted, and religion may occupy the mind in its intense emotional aspect, rapturous and sensual, with dreamy states followed by dissatisfaction on return to the usual state of mind. The over-suspiciousness of this period is a trait that easily becomes fixed unless corrected.

At this time also the other sex commences to exist, and we find the opening out of the sensual voluptuousness, the individual being easily swayed by the presence of a person of the opposite sex, even if not seen before, and sexual acts in the lower animals have a morbid attraction.

Normally, then, sociality should occur at this age, this instinct being phylogenetically deep-seated.

Thought and the two higher senses are very vivid and intense, even tending to independent existence, and the one process is liable to confusion with the other. This accounts for the existence of hallucinations and illusions; but where there exists a morbid condition of the brain, the power of discriminating sense from intellectual forms is defective, dreamy states may predominate, and the soil for the germination of insane perceptions is thus ready.

As Jelliffe has pointed out, all the senses feel the touch of poetic flight, and sound and colour pictures fill the minds of many.

Imitation is another feature of this period, since there are not sufficient data for the play of originality, and this is manifested in mannerisms, modes of walking, dress, and expression. These poses may become fixed, even contractures, and be seen as echopraxia, echolalia, mannerisms, and the characteristic exaggerated affectation, foolish and funny acting, grimacing.

Speech tendencies appear either in the direction of excess or reticence, either of which may, if uncorrected, become stereotyped, the former giving rise to verbigeration. Thought and speech are not sufficiently associated, thus leading to what is known as Forel's "word salad," and only later with the acquisition of a sounder mental capital is this tendency merged in the maturer mental powers.

The continuance of this tendency accounts for the affected speech, with catchy phrases and neologistic formations. Silly songs and absurd punning are found at this age, which is described as the age of folly.

The other speech tendency to which I have alluded leads to speech negativism, which may occur simply as an exaggerated habit reaction, and may be explained as being due to overactivation of the opposition mechanism. Here we see the relation between suggestibility on the one hand, and negativism on the other, with hypervacillation occupying a mediate position. Where there occurs some retardation in the primary idea or impulse, deliberation being retarded, then we get obsessions, phobias, impulses, or even negativism. Now the histories of healthy adolescents show the existence of this activation abnormality, but these symptoms are especially characteristic of the candidate for dementia præcox.

Serious thoughts of suicide are not infrequently entertained at this period, and we must remember that there is an absence of morality, so that lying and stealing are not uncommon, and they often cannot be accounted for.

Wanderings without any definite objective occur, being of the nature of an impulse. With these, however, I will deal later.

Distracticability is a marked feature of this age, due to suggestibility to the phenomena of the environment, and the acute sense-perception, and it is only with the onset of adolescence that adequate impulses direct the attention along certain definite channels of thought and action. If such adequate impulses are lacking, then we get the adolescent distractability—although we shall see later this is also a symptom of fatigue—and we get laziness and inability to work.

Coming to the emotional side, there is found great variability. Moodiness, causeless anger, or weeping are not uncommon, so also miserableness; and even when happy, weeping may suddenly occur, which may cause some surprise to the individual. In some there is defect rather than instability—that is, defective emotional reaction to the environment; whilst in others there is a mechanism—that is, lacking in control, to the manifestations of which the term “hysteria” is applied. This, however, is wrong, for it leads to a masking of the real nature of the disturbance, to a wrong prognosis, and to suggestions for treatment that would scarcely be given were it recognised that we were dealing with the incipient stages of psychosis. Dementia præcox is essentially an emotional disorder, this aspect being emphasised by Kraepelin, who has termed it an emotional dementia, and I have already pointed out the disturbance between the emotional reaction and the ideation.

Fatigue plays an important part in the genesis of dementia præcox in those weaklings who have hereditary tendencies, the latter qualification being important, for in the normal adolescent distraction, inattention, laziness, and dulness constitute a physiological protective mechanism.

Educational overstrain plays a considerable part, brain-workers usually suffering earliest, though of course fatigue may be produced by other work besides school-work; competitive examinations, with excessive home-work, cramming long hours at school-work, work

with little recreation, especially if the child does not sleep satisfactorily and is in poor bodily condition and anæmic, and is living under unhygienic conditions at home and school, bring about symptoms which cannot be ignored, forming a neurasthenic basis, which occurs so frequently, ushering in the dementia præcox syndrome.

Signs of this overstrain are shown in inattention, mental dulness, lapses in the memory, inability to concentrate the attention, drowsiness, headaches, absent-mindedness, increase in mistakes, nervous excitability, restlessness, irritability, even screaming, and night terrors.

Symptoms of the Pre-Dementia Præcox Stage.

Here we have the manifestations of the nervous temperament, which may appear at an early age. Sleep is often bad, these little patients waking easily, having a short, restless sleep, or lying awake after being put to bed. No disturbances of the bodily health, such as digestive disorders, post-nasals, or dentition is found to account for this; and we must also be careful to eliminate such causes as noise, too much light or bed-clothing. There may be abnormal drowsiness, the desire to continually sleep, or talking during sleep, somnambulatory phenomena, night terrors accompanied by visual hallucinations, during which the child may not recognise those around. Abnormal fearfulness may be present, so that the child dreads being left alone, and may be upset by the slightest sounds, such as the ticking of a clock; and in one of my cases the patient would go to sleep only when holding the hands of her mother and sister, who slept with her. There is abnormal excitability, and convulsions may have occurred. The child may show a tendency to start at any noise, and manifests its extreme timidity in screaming in terror over the most trivial occurrences. Vaso-motor phenomena are prominent, and we may find blanching on witnessing an accident, or the child may become very pale and scream on crossing a crowded street, or even whilst at play or in the company of others. There is extreme sensitiveness and impressionability, being looked at causing the child to start nervously, blush, or even weep, and he often does not look one in the face; to stories related to him he is extremely impressionable, reacts very markedly, and is deeply affected. Headaches and paræsthesiæ of various kinds are not uncommon. The tendency to undue excitability is seen whilst the child is playing at games, or on hearing music, and is followed by more or less exhaustion.

Pathological tire plays a prominent rôle, the child not recovering from the fatigue manifestations after the usual resting period, which indeed is often not obtained owing to the intensity of his application, is unrefreshing, and followed by a feeling of miserableness. The onset can be recognised by its distinctive signs, the headache, inattention, irritability, great increase in mistakes, lapses in memory, and tendency to day-dreaming. Now these are the signs which the teacher is the first to see, and it is important that their true significance be realised.

The child is often abnormally reticent, shuns company, and may show unreasonable hatred towards its parents, great jealousy; or, on the other hand, loquacity, or loquacity alternating with reticence. He is irritable, peevish, never satisfied, always wanting something else.

Tic-like movements are common, affecting the facial muscles or eyelids, shrugging the shoulders, snapping the fingers, or habit-spasms.

In the emotional sphere we may meet with either extreme in reaction to the environmental conditions, apathy or laziness, or sudden anger and passion, sudden changes in the mood, ecstatic states.

Fugues may occur of an impulsive character, and cannot be accounted for by the individual, of variable duration, and unaccompanied by any such effective state as we find in those of other psychoses, and without any impairment of consciousness, any apparent impairment being due to the prevailing apathy.

The appetite may show alterations, refusal of food, or gluttony, or the refusal of food at the table, but hiding or stealing it when unobserved.

Neurasthenoid and psychasthenic states require attention.

The fundamental instincts may show perverted control, and a few patients have urinated in a conspicuous place, in one case in the room in which others were sitting. Sexual tendencies play a prominent rôle, and in some cases I think constitute the disrupting agency, and there may be auto-erotic practices and exhibitionism. Masturbation may produce exhaustion, in addition to its disrupting effect on the personality. Physically, symptoms of exhaustion may be seen in the electrical reaction of the muscles, their flaccidity, rapid pulse, &c. There may be amenorrhea, or, on the other hand, profuse menstruation, which is followed by exhaustion. In some cases, with amenorrhea, perhaps associated with infantile uterus, there seems to be a causative relation, for we find flushings and feeling of blood rushing to the head associated with an aggravation of the mental condition. In some cases it seems as though the rapid body growth had outstripped the nutritive capacity of the organism.

Prophylaxis.

First of all, there are two antagonistic principles that demand consideration: the process of civilisation on the one hand, and the process of natural selection on the other. By the operation of the former we would get an egoistic superman, a being devoid of all the higher feelings; by the latter the conditions are made favourable not only for the survival of the unfit, both mentally and physically, but also for the perpetuation of the defective class, for it is notorious that this class reproduces itself more rapidly than the fitter.

Now, I have pointed out the importance of the hereditary factor in the development of the psychosis, so that it is essential, therefore, that we restrict the reproduction of these undesirable elements by a compromise between the two principles above mentioned.

The feeble-minded must be compulsorily segregated, with separation of the sexes, in industrial farms and colonies, where they may support themselves; confirmed criminals and habitual drunkards also require isolation, and there is needed more stringent control of the sale of alcohol.

In addition to this, higher ideals must be inculcated in the masses, the realisation that the instincts of the individual must be subordinated to the welfare of the race, and the advocacy of voluntary or operative sterilisation.

Especially careful must the practitioner be when advising marriage in the case of the so-called hysterical adolescent, for we have seen that this hysterical reaction is not infrequently a prelude to dementia præcox.

The children of abnormal parents require more than the usual amount of attention, and we must begin in the nursery. Inquire for signs of nervousness in infants, convulsions, over-excitability, disturbances of sleep, with restlessness, wakefulness, talking in sleep, for which no adequate cause can be ascertained, such as some unusual excitement, disturbances of the general health. The child may be abnormally fearful, especially at night, and we may then ascertain the existence of night terrors with visual hallucinations, which, if we carefully examine, may be traced to some ghost story. Avoid excitement at any time, fiction of an unwholesome kind, weird sights in picture-books, ghost stories, and harrowing tales.

The child must be encouraged in its games, and the tendency to study during the interval for recreation prevented. Frights must be avoided, and due consideration given to the phobias, anxiety symptoms, imperative ideas and impulses, such as the impulse to jump over a cliff or in the sea, to wander, set fire to things, tendencies to cringe and hold back on crossing a crowded thoroughfare. Disastrous often is the practice of shutting children in a dark room for punishment, and indeed it may lead to the development of a neurosis. The child's fears must be considered, and he must not be exposed to the objects he fears, or bullied or ridiculed in the hope that he may be hardened, but gently and sympathetically treated. Morbid moodiness and sudden outbursts of anger must be wisely counteracted; so also the discontent with its surroundings and the continual clamouring for other toys whilst those he has are as readily discarded.

Corporeal punishment is wrong, for the irritable, suspicious child is by flogging only driven more and more within himself, and the soil prepared for paranoid developments.

The signs of pathological fatigue must be recognised, the signs of over-pressure, and these children cared for more in the playground than in the school.

A pathological pedagogy is essential, and more attention given to the relation of fatigue to school-work and the differentiation of types of children in the school-work, greater individualisation, and greater care in the instruction of teachers in physical training, with

the introduction of scientific principles into the problems of education and school life. There is need also for the better arrangement of the school curriculum, with regard to the proportion of time given to mental work, physical exercises, and recreation, and the introduction of more manual work into the schools. It cannot be denied that much has been done in this direction of late, yet much remains to be accomplished.

The appointment of school doctors is important, and henceforth we should have more co-operation between the doctors and teachers, so as to decide what special plan should be pursued to suit the requirements of the particular case. Co-operation with the parents is also essential, so that the home conditions may be adapted to the requirements of the child.

The margin for the wise parent is narrow, and is not often successfully found, and error in either direction is likely to have bad results, unwise fondness leading to the spoiling of the child.

Open-air schools are now being organised, and this is a great improvement on the old conditions. Physical training is invaluable, and helps to get the higher centres under control, but must be practised daily and carefully taught.

In some cases, as I have pointed out, there is an unstable emotional mechanism, and here it is important that control be gained before passing out of this period, this being facilitated by kind and wise, yet firm, management, the avoidance of excitement, regularity, early hours, good companionship, and the cultivation of sound tastes and interests. Immorality often occurs at this time, and it is essential that this be treated early in a wise way, the encouragement of truth-telling, and the giving of pleasure, and not pain, to those around.

In addition to the inculcation of a sounder moral training, there should be means to prevent the very free mingling of members of the opposite sexes, such as occurs at the present time.

Open-air life in the country, combined with proper care and sound environment, is valuable in dealing with these queer children, and serves to assist them in gaining self-control. Intellectual studies, with the disastrous competition, should be replaced by agricultural studies and pursuits, or industrial occupations, which can now be readily acquired in special institutions, and the encouragement of manual and muscular development, with due attention to sports that do not involve competition. Nature-study is another valuable means in the education of these cases, and is now being actively encouraged in this Colony. Through these agencies he may safely pass through this difficult period, be manned, and be made a useful social unit, instead of a boorish, self-willed, anti-social, self-centred, solitary individual.

THE SEGREGATION OF THE EPILEPTIC AND FEEBLE-MINDED.

By the late J. W. Y. FISHBOURNE, M.B.

THE general principles on which the community should be guided in reference to its epileptic members are now fairly well understood all over the world, and it would be of little use to reiterate these in any detail. They may be summed up in the word "Colony-care." The colony plan of handling the epileptic has been tried now in a number of countries under very different conditions, and the longer it is tried the more does it commend itself alike to the medical profession, to the friends of the epileptic, and to the unfortunate patient himself, and to the community whose responsibility towards its dependent and afflicted members is thus at once fulfilled and lightened.

The creating for those who are incapacitated for living in the world, of a little world of their own, wherein they can be saved from suffering and being a danger to both themselves and others, seems so simple a solution of the problem, is so humane and economical, that a sense of burning impatience with the communities who are doing none of this work is the lasting impression left on the mind after reckoning up what might be accomplished compared with the little that is done.

The United States has now for nearly twenty years been doing something in this matter, so that she can give some of the results of her experience, and there is no other country whose experience can be quite so useful to Australians. What, then, do we find there?

1. Absolute unanimity as to general principles, the greatness of the need, and as to colony-treatment being the only way yet discovered how to meet it.
2. The widest difference of opinion among experts as to classification, which involves all sorts of minor questions as to cost, upkeep, income, style of buildings, location, and so forth.
3. That far beyond any such questions of details the most pressing need of all is a widespread campaign of publicity on the most modern lines among the lay public.

No one has any definite idea of how many epileptics there are in any community, but in the United States it is reckoned that there are not less than one to every 500 of the population. This proportion would make at least 9,000 of these unfortunate people in the Commonwealth. If one in five of these are so dependent as to be in need of public care, that makes 1,800. There are only a little over 100 being cared for in colonies to-day, a few—a very few—in private institutions or under adequate private care; a few, perhaps, in feeble-minded and other institutions, which provide for a certain number of epileptics. For the rest, every variety of sad fate from the ward of the insane asylum, or the poor-house, to the prison, and every form of death and accident by misadventure, not to speak of the thousands of homes among the poor made wretched by the presence of an epileptic member. In America, the States which have State-supported colonies are ten; the province of Ontario, Canada, has one.

Needless to say that the epileptic, sane and insane, clogs the wheels of every institution in those States where no separate care has as yet been provided, from the gaol to the hospital for the insane, from the refuge to the orphan asylum. Poor-houses and benevolent asylums are encumbered with wretched, misplaced, mis-used creatures. Of this state of things there can be but one opinion—that it is a disgrace to the community where it exists.

But elsewhere in those few States which have endeavoured, or are endeavouring, to handle the problem intelligently, every variety of opinion is held on details, especially upon the important subject of classification, and every possible classification is attempted.

Thus all the feeble-minded institutions house a certain proportion of epileptics, who are also feeble-minded. All the hospitals for the insane have epileptic insane inmates except in Kansas, where all the epileptic have been taken out of the insane hospitals and separately housed in the epileptic colony at Parsons.

Some of the most experienced superintendents in the country hold that an epileptic colony should be prepared to handle all classes, but I feel that the whole tendency of thought is in the other direction, and that before many years are over we will have more separation of different classes than has been thought of as yet. In all probability that will mean: colonies on the cottage system for sane epileptics, with educational provision for children; institutions of, perhaps, mixed cottage and institution form for the insane epileptic.

The Craig colony was planned at first for sane epileptics, but it has now a large proportion of insane and helpless epileptics. The present intention is to build a fresh institution in another part of the State of New York. It is now in process of erection. All this class of patient now in the Craig colony will be transferred there. This will leave the hospitals for the insane to do their proper work, will relieve them of a burden that is unfair if they are to perform that work properly, and will at the same time put an end for ever to that worst of all fates for the sane epileptic, to be driven to the shelter of an insane asylum because there is no other place that will receive him.

Far too much has been said about the possibilities of epileptic colonies being self-supporting. They can be made so under certain serious limitations, limitations that are rightly quite impossible in any State-supported institution. By the rigid selection of cases which are on the one hand able to pay something for maintenance, and on the other able to perform a certain amount of useful and profitable work, a private institution could manage to make ends meet. Such an institution would do a considerable amount of good. It would restore a number of human beings to peace, and a certain self-respecting, self-supporting status. It would also act as an object-lesson, and an experiment station. It would educate the public and public departments to a sense of the epileptic's needs, and would familiarise such patients and their friends with the advantages of colony-care.

Such an institution does, however, most emphatically not appeal to popular sentiment, and is, moreover, under the ungracious necessity of refusing the most needy and helpless cases. There may be always room for the small semi-self-supporting place of this sort,

but even a number of such do not begin to meet the claim which communities will have to acknowledge when they begin to honestly face the question: "What do we owe to the epileptic?"

On the question of why, how, and how far we are to take up this new responsibility, there is no country whose experience is so valuable to Australia as the United States, especially those States who have settled the question for themselves by establishing colonies at the public expense. The original conditions under which the country was settled, the outlook of the people, the present industrial position, are all so much more like our own than anything that can be found in England, that Americans are our natural associates in this kind of work.

It is a strange and puzzling anomaly that, while no one ever builds a house for himself without having planned it out in accordance with the present and future needs of the family which is to occupy it, public institutions are started all the time without any thought for anything but the present temporary need, and no thought as to how they will develop, what additional claims years may bring. And this in spite of the fact that a family, at least in Australia, does not need to look so very far ahead, whereas the institution, if it has any excuse for being at all, is there in response to a permanent need of society.

It is not enough to engage an architect to draw plans for the first set of buildings you intend to put up and occupy. The plan of the entire institution should be decided upon before the drawings for one building are even considered.

The class of inmates for whom you intend to provide, and the number for whom you mean eventually to provide, are both important points to consider. If you propose taking children, for instance, their needs are vastly different from those of adults.

No colony should be too far from a railway station, and yet it can be easily too near a small town.

The land must be of the very best quality obtainable, and the more easily tilled the better.

At least one acre per patient is the amount of land which American experts consider necessary in making provision for a colony. This allows room for a farm, grazing paddocks for the dairy cattle and horses, also plenty of space for the patients to roam about in under conditions where the sexes need not come too closely together.

The water supply must be abundant, and of the very best quality.

The cost of supporting the average epileptic is considered to be greater than that of the average insane person. The food has to be more carefully regulated. There is much more destruction of clothes and wear-and-tear on crockery and furniture than in an insane asylum. On the other hand, as time goes on, there will probably be a much better return in money-value from the patient's work. The movement is still so new that there is hardly a patient in any colony who had been a sufferer for many years before admission, whose earning capacity had all these years been deteriorating instead of improving.

Under a system of better classification it will be possible to discriminate more exactly between the patient who is a heavy cost to the community and the patient who helps to make his own keep.

I have come to the conclusion that most medical effort is at present being focussed upon the wrong point. What we urgently need to-day is not the specialist, who by research or clinical study will add to the scientific knowledge of the disease, desirable though this may be. What we need are some who will educate the laity, or who will so stimulate a few of the laity, that they will be driven by the pressure of this new knowledge, both painful and hopeful, to go out and give no one else any rest until the community in which they live are sufficiently aroused to a sense of their community responsibility.

The medical profession already knows quite enough of the important and basic facts concerning epilepsy to pass on the information in simple form to laymen and laywomen. They know that it is practically incurable, that in most cases it is probably transmissible in the form of some neurotic disorder; that its victims, neglected, tend to grow worse, to develop insanity or criminal tendencies. They also know that the epileptic population is a constant expense and a drain upon the resources of the sound members of the community. And they also know that a practicable method of handling the epileptic, as a social problem, has been discovered. But if this practicable and economical method—the establishment of colony-care for every dependent and helpless epileptic in any community—is to be carried out, the plan costs money in the first instance, and costs a certain amount in constant upkeep. That money must come out of the pockets of the public, and the public are not going to authorise that expenditure until they have been taught that it is a wise and necessary expenditure, and in the end a truly economical way of spending public money.

Now, how is this to be done? We have seen that the scientific within-the-profession study of the disease does not advance the education of the public by one iota. It remains, as ever, a subject far away from lay interest and lay responsibility.

To a large extent, this public ignorance and public apathy exists everywhere, even in those few communities which already have their epileptic colonies established, but least of all in these because there has always been some educational work done before such a colony could be started, and once it is started such an institution becomes a focus of interest and a means of education for the whole city or state or country.

I look back to what has happened in the analogous case of tuberculosis. We can all look back to a time when tuberculosis of the lungs was ascribed popularly to "consumption being in the family." Cure was looked upon as in most cases practically hopeless, the only hope being in a change of climate. When modern views of the real nature of the disease and its rational treatment had been adopted by the medical profession, it was still a long time before these permeated the public mind. That public was not reached merely by medical advice, public hospitals, or private practice, or through medical conferences, good as all these means may be. The public was reached by being shown that the question was a social problem that concerned everyone. The architect and the ventilating expert were interested when they knew how large a part pure, dry, abundant air could do towards effecting a cure. The farmer, the agricul-

turist, and the housekeeper all learnt something of the relation between good food, proper preparation, and the healthy homes and strong bodies that would keep tuberculosis at bay and help to cure its inroads. The statistician, the secretary of the friendly society, all acknowledged that the tuberculosis problem was their problem.

In not one of these aspects can tuberculosis be considered a purely medical problem, although no one of them can be fully and intelligently settled without reference to the medical side of the question. All the other sciences have to be called in to contribute their quota of aid if we are to deal humanely with the consumptive, and fairly by the rest of the community.

But again, if we had not gone a little further than this, if we had merely dealt with those afflicted with tuberculosis as if they and their malady were the concern merely of this aggregate of expert scientists, medical men and economists, statisticians and geographers, we should have done but little for their relief. We should have been in the never very creditable position of possessing a great amount of information and applying it very parsimoniously. But fortunately for everyone, in reference to tuberculosis, we have passed that stage. We have not ceased to be scientific, but we have seen the malady as a human question, and when we can see the human relation, then, and not till then, do we make anything a public question.

And the more scientific side-lights we can throw on our subject the greater variety of people can we interest.

How has this been accomplished? By a long, patient process of educating the public; of getting the public to educate the public; by the Press; by lectures; by dinning into everybody, in season and out of season; by remembering that until this huge piece of education was accomplished, we were not going to get any further, that all the specialist information in the world was not going to do anything except assist or cure a certain favoured few. We cannot do anything on a big scale that will affect so huge a problem until we can get money, and we are not going to get money in any considerable amount, either from individuals or from public funds, until the public imagination is touched, until we have brought home to them vividly and unforgettably the responsibility that lies upon each one of them to relieve that need.

I have dwelt thus long upon what has been accomplished with tuberculosis because of the closeness of the parallel that it offers to this other problem that we are considering. But we have still in our midst an even more far-reaching source of evil, to which, unfortunately, we in Australia pay no attention. I mean the problem of the feeble-minded. The opinion is gaining ground amongst those who have studied the subject that legislative interference should be invoked to check the appalling increase of that most hereditary of all diseases, feeble-mindedness, as well as epilepsy. There are more feeble-minded persons in the community than anyone has any idea of. The United States of America recognise the danger, and England is beginning to waken up to the seriousness of the problem.

The report of the Royal Commission on the care and control of the feeble-minded has had a startling effect. The commissioners

say:—"Of the gravity of the present state of things there is no doubt. The mass of facts we have collected compel the conclusion that there are numbers of mentally defective children, persons whose training is neglected, over whom no sufficient control is exercised, and whose wayward and irresponsible lives are productive of crime and misery, of much injury to themselves and others, and of much continuous expenditure wasteful to the community and to individual families." This Commission made an attempt to determine the number of the mentally-defective, and got the following figures:—In Scotland, one in every 400 of the population; in England, one in every 217; in Ireland, one in every 175 of the population. In the States of America they consider that one in every 300 of the population is a fair but moderate estimate. Australia has, in my opinion, an unparalleled opportunity of making a complete census of children of school age throughout the Commonwealth. Every three years the police are required to visit every house to ascertain the names of all adults living in each house who is entitled to the franchise. In the same schedule the householder might be asked to give the names of all children living in the house between the ages of 5 and 15, and state what schools they are attending. This part of the schedule should be sent to the Education Department, who would thus find out those children who did not go to any school, and the reason, such as epileptic, paralysed, blind, &c. The medical inspector or schoolmaster will know the defective who are going to school. The truant inspector or school nurse should ascertain why the others do not go to any school. In this way we may arrive at an approximate number of the defective children in each State, a matter of very great importance, and which at present we have no means of ascertaining. It will be a matter of considerable care to discriminate between the merely backward and the feeble-minded child, the latter being taught principally to work in such a way as to be able to maintain himself in after life, when, under supervision, he can be kept happy, contented, and working all his life. Dr. Martin Barr, the Chief Physician of the Pennsylvania School for Feeble-minded, at Elwyn, eloquently writes in the *American Review*:—"Society must be protected from pollution and tragedy on the one hand, and on the other the innocent imbecile must be saved from punishment for heedless or reckless transgression for which he is absolutely irresponsible. The interests of both demand, therefore, permanent sequestration." The Spartans recognised this law of self-protection, and, being forced by their circumscribed limits to choose the lesser evil as the greater mercy, they sacrificed the weak for the strong, and put to death their defective in early infancy, in order to protect the integrity of the State. We, with our broad territory, are able to meet the same issue in a more humane way, but with us also a national need can only be met by a national provision. The Government provides for the Aboriginal; then why should it not care for this race which is at once more helpless and more aggressive, which is incapable of self-preservation, and fast becoming a standing peril to the nation. The unoccupied lands of the State give free space and opportunity for permanent sequestration under happiest conditions. Colonised thereunder under wisely-ordered provisions, protected from society

and society protected from him, safe from the temptations of the world which does not understand him any more than he understands it, he would be given his freedom under law, and a true Junior Republic might be established for these grown-up children of the nation. Rapid as has been the advance in our knowledge, it has not kept pace with the appalling increase of imbeciles. This is owing, in a great measure, to a misapprehension of the evil and ignorance of its cause, and a consequent indifference to its tremendous effect.

Miss Mary Dendy, in a paper read before the economic section of the British Association, wrote:—"As years ago our nation realised that we had no right to populate a new country with criminals, and ceased to send its convicts abroad, so now we should realise that we have no right to provide for our future a feeble, helpless, half-witted population. That is what we are doing at present there is no doubt, seeing that the main cause of feeble-mindedness is heredity."

THE TREATMENT OF MENTALLY DEFECTIVE CHILDREN FROM A NATIONAL STANDPOINT.

By E. M. STEVEN, M.D. (Edin.).

ALLOW me to express my sincere regret that I am unable to be present at your Congress.

The question of the treatment of the mentally defective is of comparatively recent date, but it is considered to be of such growing importance that it has reached very considerable dimensions in several of our large cities. During a world's tour two years ago I had occasion to make exhaustive inquiries in most of the large centres of population, as to the methods adopted by the various Educational authorities for the medical inspection of school children. The mentally defectives and their treatment naturally came under this category. Now what is meant by mentally defective as applied to school children? Time after time I asked this question, which was answered by the school medical officer in each centre usually by inviting me to visit the special schools which have been established to meet the requirements. So varied were these in composition that I would like to mention those of London, Edinburgh, Glasgow, and Wiesbaden.

London, Osborn Place School.—Here there is a subdivision of the scholars into four classes. In the junior class for children just admitted, many—the majority, in fact—are palpably mentally deficient. It is noticeable, however, that the children in the elementary classes show a marked contrast as compared with the higher class pupils. They manifest considerable interest and even enjoyment in their school work, indicating that their minds are capable of being applied to a subject if the necessary attention be given. Dr. Kerr, Chief Medical Officer for the London County Council, deplors the fact that many of these children were removed by their parents (having reached the statutory age) before their education at the school had been completed. Many of them, however, become useful members of the community. From statistics which were taken three years ago, only 10 per cent. were classified as unfit to earn their own living, and only 20 per cent. able to contribute to their own

support, while 70 per cent. were classified as likely to become useful citizens. Dr. Kerr states that these figures seem to him to err on the side of optimism. A visit to these schools will demonstrate to the most sceptical that the London County Council are obtaining for the masses results that were only possible hitherto in private institutions with limited accommodation. Should these results be only half realised, they must prove a resisting element in the prevention of crime, poverty, and destitution. The object of these schools is not to attempt to treat the imbecile or idiot, but those children who are apparently not capable of absorbing the various educational advantages unless "spoon fed," special care being given to each individual child so that as many as possible may be advanced to such a stage as will enable them to earn their own living either partially or entirely.

Edinburgh.—At a visit paid to the only special school for mentally defectives, the junior members of the class were found to be a very sad lot indeed. There was scarcely one who could be said to be sane, and more than half were palpable imbeciles. These were admitted, I understand, through influence brought to bear by some members of the school board. The pupils in the higher forms were little better—and it seemed to me to be a waste of time and energy to attempt to supply mental pabulum where none exists. The School Board, however, seems sanguine that at least some will be able to provide for themselves in after life. The contrast between the special schools of London and Edinburgh is indeed very great. In the latter case only one school is provided for forty pupils, most of them are imbeciles, and it is estimated that there are at least 400 who might be classified as mentally defective. A sub-classification must eventually be made, and the incurably imbecile provided for.

Glasgow.—The Bridgeton School for mentally defectives is a typical example of those which have been provided in Glasgow for the care of children who are a stage removed from that of imbecility. The majority of these are picked up off the streets, barefooted and miserably clad, hungry, and footsore, their eyes swollen and congested through inability to acquire suitable rest and sleep. The masters in the elementary schools must refer them to the medical officer for examination, as they have not acquired sufficient knowledge to entitle them to be promoted to a higher class. They are taken care of and fed, the result being that a fair percentage become decent members of society. The majority of the children admitted to this special school come under this category—mentally defective through starvation and want of sleep—a very marked contrast between Edinburgh and Glasgow—no imbeciles are admitted.

Wiesbaden.—In Germany the term mentally defective is not used, but *Hilf Schule*, or Auxiliary School. Wiesbaden shows a wretched example of the younger generation. In the older classes more than 25 per cent. had a decided squint, several had Hutchinsonian teeth, some were plainly future occupants of asylums, while the remainder bore the hall-mark of starvation and neglect.

The late Dr. Cuntz, who accompanied me around the schools, explained the reason why imbeciles were admitted—parents do not and will not realise when their children are hopelessly imbecile, and owing to weak-mindedness the school authorities are unwilling to adopt stringent measures to debar them from entering an Auxiliary School.

Now, what might be a definition of a mentally defective child? From the foregoing it will be seen that each country differs as to the true meaning. Dr. Bishop Harman is attempting to solve the problem in rather an ingenious way, by making a definite workable standard on which to base a child's mental calibre. His system of estimation is based on a maximum of thirty points :—

	5 marks for age compared with class average,
10	„ class work,
5	„ general wits,
5	„ games,
5	„ craft, woodwork, &c.

Thus, if a child is older than class average he may receive only 4 marks, class work poor, 2 or 3, &c.

Should a child receive less than 10 marks he is classified as mentally defective and a fit subject for special school.

This seems to me to be a very fair method of selection and discrimination as compared with the London County Council form for mentally defectives.

Question 9. What is the mental capacity of the child? The following have to be answered :—

Observation, imitation, attention, memory, reading, writing, calculation, colour, special tastes.

Then again, "Is the child obedient, mischievous or spiteful, stupid or bright?"

These questions appear to me to be somewhat difficult to answer satisfactorily, and the whole is covered under Dr. Harman's scheme.

Looking at the question of the treatment of the mentally defective, one is often much inclined to adopt the Spartan idea in early life. Is it wise for any nation to allow a child who is a palpable imbecile to survive at all? He must inevitably become a burden on the State. He is of no practical value to himself or others, and the moral aspect of the case is an exceedingly doubtful one. There is more illegitimacy among the mentally defective children in London than in all the other schools put together. Animal nature is not coincident with a prolixity of cerebral tissue. The natural balance must be maintained. The whole question will resolve itself into one of the survival of the fittest. From time immemorial the nations of the world have progressed according to the advancement of education. The slothful, the indolent, and brainless find their level at the foot of the ladder. Improvements in the environment of children who have been palpably neglected will prove of considerable value to a nation, but your cretins, idiots, imbeciles, should they propagate their species, must tend towards retrogression. In a word, a wise policy of discrimination must prove of inestimable benefit to any nation, the segregation of those who are likely to prove a menace to the progress and prosperity of the greatest number; lives must be sacrificed if necessary so that the mental balance of the nation may be maintained. The question of emasculation is also one which might seriously be considered, and although abhorrent to many, would undoubtedly materially reduce the roll of the inhabitants of your prisons, lunatic asylums, and destitute homes.

THE FEEBLE-MINDED—THEIR CLASSIFICATION AND IMPORTANCE.

By HARVEY SUTTON, M.D. (Melb.).

IN introducing the subject of the classification of the feeble-minded, I do so with some trepidation, seeing that so little agreement exists even among the expert and experienced.

My chief object is to describe briefly the preliminary work done in the Victorian Education Department, and to put before you in detail the Binet method employed in our investigations.

For many years alienists have been alive to the problem of the feeble-minded and other mental defectives in our midst.

The classification of these children is in an unsatisfactory condition, so many methods have been suggested, with varying results, according to the point of view adopted.

The definitions of the Royal Commission give us our first general division into idiots, imbeciles, and feeble-minded, all of whom are defective in mind from birth, or from an early age, but are either unable to guard themselves from common physical dangers (idiots), or, if so able, are incapable of self-support (imbeciles); or, in the case of the feeble-minded, though able under favourable circumstances to earn a living, fail in the ordinary stress of competition, or cannot manage their affairs with ordinary prudence.

The clinical types marked by skull variations and other physical alterations—the micro- and hydro-cephalic, the mongoloid, the cretin, the amaurotic, the diplegic, &c.—are of little importance, for they form a very small percentage of cases; and, further, the clinical type gives us no real idea of their mental qualities. For example we found a well-marked hydrocephalic, aged 12 years, in the fourth class—i.e., of practically the standard class age. Various other gradings have been advocated—Barr, Smedley, De Sanctis, and Binet; the child has been tested anthropometrically in order to get some idea of his trainability.

Here Barr has laid some stress on the value of testing the power of grasp (dynamometer) and the vital capacity of the lungs (spirometer) as giving a reliable representation of nervous motor control of muscles, but such may at times only measure movement and not mind.

Goddard, of Vineland, New Jersey, suggests a modification of the Binet decimal system, the tenth grade equalling the normal child, idiots, imbeciles, and feeble-minded being divided each into three grades—*e.g.*, the high-grade idiot is just able to feed himself; the low-grade imbecile can in addition imitate movements; the middle and high-grade imbecile reach a standard, at best, of about 3 and 5-year-old children; while low and middle-grade feeble-minded may equal that of 7 and 9-year-old normals.

The attempt is really to obtain some idea or estimate of the educability of the child, and thus give a reliable prognosis.

The system of questions arranged by Binet and Simon is designed by them as a measuring scale of intelligence. For the details I am indebted to Dr. Goddard, of Vineland, New Jersey.

Two most important factors are taken into consideration, which in most clinical methods have been left largely to guess-work, namely, the influence of—first, the age; and secondly, the previous training and education of the child. The questions are therefore arranged to suit each year of life, and the effect of previous training eliminated by asking questions relating to information which a child should pick up for himself from his surroundings.

The personal factor of the child and of the examiner, however, still remain. With careful work, and as the confidence of the child is gained by encouragement and some times also by privacy, these too may be controlled and more uniform success achieved.

Although one began work rather prejudiced against the method by the apparently trivial character of some of the questions, increased practical acquaintance with the method showed with what surprising accuracy it worked. Personally, about 100 children have been tested, and these included, in addition to backward, children sent in error for physical, not mental, defect to the medical officer. These were readily picked out by the method, and reacted very closely to their real ages. The results with the backward, on the other hand, corresponded with the school estimate—that is to say, the age given by the Binet test was the average age of the class the children had reached; *i.e.*, a backward child of 13 years of age from the second class was placed in intelligence by the tests as equivalent to a normal child of 9 years of age—the average class-age of the second class.

The tests given range over the years 3-13; the child is regarded as backward if one or two years behind; if more than three years backward, the condition is very suggestive of feeble-mindedness.

In order to allow for unevenness of development, the child is allotted the highest age for which he has succeeded in all tests save one, and, after this level has been fixed upon, advanced one year for every five higher tests, and two for every ten higher tests passed—*e.g.*, a boy of 9 fails in two of the 9-year-old tests, temporarily put at 8 years, but in addition to three 9-year-old he passes three 10-year-old tests, advance one year, and call normal.

If used with judgment and intelligence, the authors claim that the tests represent clinical experience, and are almost mathematically exact.

In applying the tests the child should be examined in a quiet place, where his attention can be obtained, and distracting surroundings avoided. The whole thing is best treated as a game, and the child constantly encouraged, thus avoiding any sense of failure. Tests of an age that it seems probable that he will succeed in are first tried, and the confidence of the child thus being gained, the tests for higher ages are then taken.

The following are the tests:—

For three-year-old child:—

1. *Where is your nose?—eyes?—mouth?* Answered by gesture.
2. Repetition of sentence of six syllables:—“*It rains; I am hungry.*”
Easier to repeat than to speak spontaneously. Try with two syllables, then four. Repeats six syllables at 3 years of age, not 10.
3. Repeat two figures, “6-4.” More attention required with figures than words, because meaningless to them. Repeat distinctly half a second apart, without separate emphasis.
4. Describing people, pictures, and a situation—
 - (a) Woman, old man, on a park bench with snow—“*Winter.*”
 - (b) Man and boy drawing a furniture cart.
 - (c) Man in prison looking out of window—couch, chair, &c.
Three-year-old names things—*i.e.*, enumerates, but does not describe.
5. Names of the family—all their first names. *What is your name?*

Four-year-old child:—

1. Sex. *Are you a little boy or a little girl?* Not at 3.
2. Name familiar objects—key, knife, penny. *What is this?*
3. Repeat three figures. 7, 4, 8.
4. Comparison of two lines—parallel, $\frac{1}{2}$ inch apart, 2 and $2\frac{1}{2}$ inches long. *Which is the longer?* Hesitation—failure.

Five-year-old child:—

1. Weights in similar pill-boxes—3-12; 6-15 grammes respectively.
2. Copy a square $1\frac{1}{2}$ -2 inches square in ink (harder than in pencil). Must be just good enough to recognise as a square.
3. Patience with two pieces. Cut visiting card diagonally; place a whole card on the table and nearer the child, the two pieces with the hypotenuses away from one another. Make a figure like the uncut card. May be—(a) Too indolent to try; (b) one piece turned over, then impossible. No assistance, even by a look, to be given.
4. Count four pennies—four in a row—count with fingers.
At 3 years, none; at 4, one-half; at 5, all succeed.

Six-year-old child:—

1. Right hand, left ear. *Show me your right hand; now show me your left ear?*
 - (a) Does not know. Puts out right hand, but also touches right ear.
 - (b) Is not quite sure. Touches right ear and then corrects itself.
 - (c) Knows, and does not hesitate.
 Reject (a) at 4, none; at 5, one-half; at 6, all succeed.

2. Repeat sentence or group of sentences, sixteen words in all—*e.g.*, “*Boys work on the farm. Girls work in the house. Boys and girls go to school.*”

At 5, one-half; at 6, all.

Compare the messages children sent with.

3. *Which is prettier?* Sketch three pairs of heads, one in each pair a caricature.
4. *What is a house—fork—table—chair—horse?* Describe either by use only—a horse to ride on, or describes—better than by use—an animal we ride on. Three definitions by *use* = pass.
5. *Three commissions.* Do you see this key? Put it on that chair; then shut the door. After that bring me the box that is on the chair. Remember first the key on the chair, then close the door, then bring me the box.

No further help; everything to be done.

6. *How old are you?* In years.

7. *Is this morning or afternoon?*

Seven-year-old child :—

1. Unfinished pictures—four simple sketches; *e.g.*, figure without arms—profile face without nose—profile face without eye—three-quarter face without mouth. *What is absent from the picture?*

5 years, none; 6, two-third errors; 7, very accurate.

2. Number of fingers:—*How many fingers on your right hand? How many fingers on your left hand? How many fingers on both hands?* Must answer without hesitation, and exactly right without counting.

At 6 years, only one-half.

3. Writing from copy:—*The little Paul* (two capital letters), shows training, but deviations from the copy suggestive. “Passed” if it can be read by anyone ignorant of the copy.
4. Copying a diamond—rhombus. Passed if intended for diamond.
5. Repetition of five figures—47935.

Three-fourths succeed.

6. Description of a picture (see 3-year-old tests). Describes, not merely enumerates.
7. Count thirteen pennies in a row, counted with finger; touch at same time as it names number. None counted twice or omitted; thirteen given exactly.

At 6 years, two-thirds fail; at 7, no errors.

8. Name four common pieces of money:—Penny, threepence, sixpence, **one** shilling.

At 6 years, few; at 7, most.

Eight-year-old child:—

1. Reading—for two memories. Limit between imbecility and feeble-mindedness. Provided previous teaching, this limit is given by a reading test:—

“THREE HOUSES ON FIRE.

“Melbourne, 30th October.

“A big fire in Fitzroy last night destroyed three large houses in the centre of the city. Seventeen families are without shelter. The loss exceeds ten thousand pounds. While rescuing a child in its cradle a barber's boy had his hands severely burnt.”

Triple purpose:—(1) Knows how to read; (2) rapidity of reading; (3) understands and retains a little of his reading.

8 years, forty-five seconds; 9 years, forty seconds;
10 years, thirty seconds; 11 years, twenty-five seconds.

Five degrees:—(a) Spelling out; (b) reading by syllables; (c) hesitating; (d) fluent; (e) expressive.

Wait a few seconds after the reading has finished, and then say: “*Tell me what you read?*” Write down his words and count the number of memories expressed. The greater the difficulty of reading the fewer remember. No matter how slowly read, two memories at least. To have six memories, must be done in one minute.

Rarely at 7; usually at 8.

2. Counting stamps—three one penny and three twopenny.
3. Name four colours, in six seconds:—Red, blue, green, yellow.
Test of colour names not sense discrimination. Touch each with fingers and ask, “What is that colour?”
4. Count back 20-1, in twenty seconds.
5. Write from dictation, “The pretty little girls.”
7, only one-third; 8, all.
6. Compare two things from memory. Difference between butterfly and fly—wood and glass—paper and cloth. Make as intelligible as possible. Why are they not alike? Two out of three correct; if more than two minutes, fail.
6 years, one-third; 7, most; 8, all.

Nine-year-old child:—

1. Name—*day of week—month—day of month* (within three days)—*year*.
2. Days of the week in order—ten seconds; not before nine.
3. Make change. Play shop with real money, *e.g.*, 2s. less 9d., 1s. 3d. change.
4. Definition better than by use.
7-8, half; 9, all. (See 6 years.)

5. The six memories from reading (see 8-year-old).
8, hardly any ; 9, all.
6. Arrange weights—five wooden cubes, same size and appearance—6, 9, 12, 15, 18 grammes. All do not weigh alike. To lift them one at a time and put them in order from the lightest to the heaviest. Record order, three trials, two to be absolutely correct, not more three minutes.

Ten-year-old child :—

1. *The months of the year*, in order in fifteen seconds. One mistake allowed.
2. Nine pieces of money, not in order of value. To point and name.
3. Three words to form a sentence—"Sydney, Fortune, River."
"Melbourne, Money, River." The first test by invention—
(a) Three separate sentences ; (b) two ideas in conjunction ;
(c) single idea. Accept (b) and (c). One minute.
8, none ; 9, one-third ; 10, half.

4. Comprehension questions :—

- (i) *What ought one to do ?* when—(a) Missed a train ; (b) struck by a playmate by accident ; (c) broken someone else's belongings.

Two correct out of three ; 7-8, half ; 9, three-quarters ;
10, all.

- (ii) (d) Detained and late for school ; (e) before taking a part in an important affair ; (f) why excuse a wrong done in anger than without anger ; (g) if asked one's opinion of a person of whom one knows very little ; (h) why judge a person by his acts rather than by his words.

Twenty seconds each ; three out of five correct.

Eleven-year-old child :—

1. Criticism of absurd sentences. To test absurdity of ridiculous statements :—" *I am going to give you some sentences in which there is nonsense. Listen carefully, and tell me what you hear.*"

- (a) I have three brothers—John, Paul, and myself.
- (b) An unfortunate cyclist had his head broken, and is dead from the fall. They have taken him to the hospital, and they do not think he will recover.
- (c) The police found yesterday the body of a young girl cut into eighteen pieces. They believe that she has killed herself.

About two minutes. Good answers in two out of three.
9, hardly any ; 10, scarcely one-quarter ; 11, half.

2. Three words in a sentence (see age 10).

11, all

3. Sixty words in three minutes. *Say as many words as you can in three minutes.* (Splendid opportunity to follow child's ideas.) Sixty words passes.

4. *What is charity?—justice?—goodness?* Two good definitions; if essential idea, then accept the just introduction of the abstract.

10, one-third; 11, usually.

5. *Make a sentence out of these words :—*

Hour—for—we—good—at—park—a—started—the.

A—defends—dog—good—his—bravely—master.

To—asked—my—have—exercise—teacher — correct —
my—I.

One minute for each sentence; at least two sentences.

Twelve-year-old child :—

1. Repetition of seven figures :—

2—9—4—6—3—7—5.

7—2—9—1—3—6—4.

9—2—8—1—5—6—4.

“ There will be seven figures.”

Three tries; one success.

2. Rhymes :—Explain rhyme; ask child for rhyme for given word—“ day,” “ spring,” “ mill.”

One minute; three rhymes for each word.

3. Repeat sentence of about twenty-six syllables without an error :—

(24) Children, it is necessary to work hard for your living; you must go every morning to your school.

(26) The other day I saw in the streets a pretty young dog. Little Tommy has got spots on his new apron.

(28) Ernest is praised very often for his good conduct. I bought at the store a beautiful doll for my little sister.

4. Problem of various facts :—

What is it?

“ A person who was walking in the bush at Lilydale suddenly stopped, much frightened, and ran off to the police station, and told the police he had seen hanging from the bough of a tree a” (After a pause)—“ What?”
“ A dead man.”

“ My neighbour has been having strange visitors. He has received one after the other last night a doctor, a lawyer, and a clergyman. What has happened at the house of my neighbour?”

Both to be correctly answered.

Thirteen-year-old child:—

1. Cutting out; get his attention; let him see you fold a sheet in four; cut a small triangle with scissors from the edge which does not open. Ask him to draw a picture of the paper when unfolded. Do not unfold or allow another sheet to be folded. Difficult. If done the first time ask if he has seen it before.
2. The reversed triangle:—Cut a visiting card along diagonal. Describe resulting shape if one triangle turned about and short leg placed on the other's hypotenuse, the right angle being at the smaller of the two acute angles.
3. Differences:—
Pleasure—honour. Evolution—revolution.
Event—advent. Poverty—misery.
Pride—pretention.

Requirements for satisfactory test.

Quiet spot; child free from distractions or by himself; no need to fatigue child. Constantly encourage him and begin with tests either of age or below, according to what you think he will succeed in doing; then on to the more difficult sets.

Do not keep him waiting, as this spoils the game; an assistant to record exactly what the child says and does is very helpful. Child to be regarded as X, the unknown quantity to be determined, and all preconceived ideas should be forgotten.

Used with judgment and discretion, they represent clinical experience, and are almost mathematically exact in their findings.

In order to make some systematic attack on the problem a committee, consisting of representatives of the Education Department, the Director, an inspector, a head teacher, a teacher, and a school medical officer, together with the Inspector-General of the Insane, met and discussed the question. They recommended that a *beginning be made—*

1. By registering the school at the Kew Cottages in the grounds of the Hospital for the Insane as a school for mentally defective children.
2. By establishing a school for feeble-minded children, this school to provide specially for the manual training of the elder children.
3. By forming, where practicable, ungraded classes for abnormally backward children in large schools.

They further commended to the future consideration of the Minister the bringing into a more satisfactory condition the education, care, and control of mentally defective persons by the better organisation and development of the various State and private agencies now dealing with these cases.

(See an Introduction to Experimental Psychology, Myers, Cambridge Manual⁸. - Cambridge University Press, 1911. 1s. 3d.)

This will involve the problem—

1. Of continuing the education of certain defective children till 21 years of age (as in the recent New Zealand Act) ; and
2. Of providing an institution on an industrial and farm colony basis for the permanent care of certain feeble-minded persons who are not proper persons to be free from guidance and control.

These proposals were received favourably by the Cabinet, and they asked for a return of the estimated number of cases to be dealt with in a special school.

Working with Mr. Hauser, a teacher of the Education Department specially interested in these cases, I visited eleven schools in the metropolitan area and investigated the physical and mental condition of about 800 children, selected according to our directions by the teachers. All metropolitan head teachers were asked to furnish a return of all backward children—i.e., all children two years or more behind class age, and to further classify them according to the probable causes of retardation.

First of all, those backward from casual causes were listed, such as irregular attendance and truancy, late arrival at school, shifting about from school to school, immigrant, prolonged illness, or bad home conditions (child labour, poor food, &c.), and physical defects, such as defective eyesight and hearing.

The remainder, classed as backward owing to poorness of intelligence, were further subdivided by the teacher into those where the child seemed only slow and stupid and those where the intelligence seemed abnormal. These latter—the mental defectives—were finally classified according to the definitions of the Royal Commission into feeble-minded, imbecile, and idiot.

In addition to these returns from State schools, the metropolitan truant officers furnished figures showing those feeble-minded children known by them not to be attending school or to be attending schools other than State schools.

And, further, a few cases forwarded by private medical practitioners have also been appended.

With regard to the school returns, two important features were noted. In every school visited our estimate of suitable cases for special investigation and teaching definitely exceeded that made by the teacher.

Only three imbeciles and no idiots were met with. Therefore the low-grade types known by hospital experience to exist in some number in Melbourne are not found attending school.

For these two reasons the teachers' returns may be regarded as representing a minimum, and as only including the higher grades of feeble-mindedness.

Schools visited, 11 ; average attendance, 9,000 ; number of children examined, 800.

Cases suitable for special education and investigation:—

22 markedly (including three imbeciles).

70 moderately.

= 92 feeble-minded.

—
48 very suspicious.

Returns by head teachers of 68 State schools. No returns from 40 (not included in the above list).

Number of Schools.	Average Attendance.	Feeble-minded.		Very backward.
		Definite.	Probable.	
68	37,407	212	273	298
11	9,000	92	48	...
Grand Totals 79	46,407	304	321	298
Per cent. per school population ...		Per cent. ·65	Per cent. ·7	Per cent. ·65
Gross percentage		1·35 per cent.		2

Return of truant officers of 9 out of 13 metropolitan areas:—

54—13 mental defectives not attending any schools.

35 mental defectives not attending any State school (Roman Catholic).

6 mental defectives not attending any State school (private).

Return from 8 medical practitioners—13 not included above.

Gross total—304 + 54 + 13 = 371 definite, 321 probable.

The figures obtained are very incomplete, but show that there are known to exist in the metropolitan area children requiring special educational treatment and investigation, a minimum number of—

1. Definite cases of feeble-mindedness 371
2. Probable cases of feeble-mindedness 321
3. Suspicious cases of feeble-mindedness 298

990

The school percentage of the definite cases which are complete failures in ordinary schools, and can only be properly controlled and cared for in special schools, is ·65 per cent.; or, for the whole metropolitan school population, 371.

These results, we consider, demonstrate that the problem of feeble-mindedness is a large and important factor in school life. As a special school is the best step known to us by which the proper care and control of these children can be obtained, its establishment becomes not merely a desirable, but an urgent and necessary measure.

It is proposed to select the pupils for such a school partly by—

Direct application by parents ;

Nomination by teachers ;

Recommendation of medical practitioners,

and submit all applicants to a thorough medical examination. Anthropometrical and psychological tests could follow later in the case of accepted children.

It is not intended that the school should be merely the dumping-ground for the remnants, but rather a school for the investigation of all cases, doubtful or definite.

The question of meals and of transit might partly be met with by including a cookery school in the building, and supplying the children with lunch, while in the morning and evening conveyances of various kinds would bring them and take them back home.

The curriculum following the English methods will furnish them primarily with training in clean habits and good manners. Later, or at the same time, the special senses and bodily activities will be developed by appropriate training in kindergarten style, then occupational and industrial possibilities may be exploited, and so the child rendered not merely safe, but self-supporting.

In addition to its direct value in training the child, such a school would be a valuable training ground for teachers, where they could realise the difficulties and methods in dealing with these children, their recognition and their control, and so allow of the formation of intermediate or auxiliary ungraded classes in big schools which would act as a drag-net for these cases. It would also offer valuable opportunity for psychological research.

Its greatest value will probably be in clearing the ground for the establishing of after-care colonies for the segregation of unsatisfactory cases of mental defect, especially the feeble-minded.

Only by such a method, which, while it gives the child every opportunity for developing the best in him, carefully investigates his physical and mental possibilities, can the inevitable objection of interference with the liberty of the subject be overcome. The freedom of the individual has from all time been jealously guarded by Anglo-Saxon communities, and only the most definite knowledge, such as a special school would provide, will be allowed to affect this privilege.

Finally, the necessity exists for interesting and convincing the general public in the need for the care and control of mental defectives. Here we may advance four main reasons to our advocacy of the interests of the feeble-minded.

Humanitarian and Individual.—Feeble-minded children are the immediate result of heredity, not environment, and hence are handicapped owing to no fault of their own. Education can develop the best in them, and render them no longer a nuisance both to themselves and to others. It indeed is their main road to happiness.

Social-Communal.—The segregation of these unfit will eliminate many undesirables from the community, and diminish the intensity of many social problems, removing, as it does, large numbers of recruits of classes such as criminals, prostitutes, unemployables.

Economical.—Closely bound up with this is the economical side, for it is not sufficiently realised that the feeble-minded is incapable of self-support, and has to be kept. At present he is supported in irregular fashion at the cost of the community, in charities, gaols, &c.

Again, the presence of these children in schools is a great handicap, not merely to their own education, but also to that of their normal fellows in the same class. They are as so much grit in the hub of the educational machine.

Racial.—Finally, the racial side must be remembered. One of the principles of eugenics is to eliminate in ideal fashion stocks definitely undesirable. It has been shown that the families of feeble-minded are large, and often mentally defective. Their numbers exceed the average number in the ordinary family, so that our problem increases with each generation. Again, the economical side presents itself, for if you do not help to check their increase you and your children will have to pay for their support.

CLINICAL DEMONSTRATION OF KINDERGARTEN METHODS AS CARRIED OUT IN THE HOSPITAL FOR THE INSANE, NEWCASTLE.

By ERIC SINCLAIR, M.D. (Glas.), Sydney.

So little has been done with the education of feeble-minded children in New South Wales, that it may be said to have been practically neglected. The only Public Departments which have so far done anything at all in this direction, are the State Children's Relief Department and the Lunacy Department. The former has a cottage near Parramatta for sixteen children, and one at Mittagong for forty-two children, in both cases of the feeble-minded class. The children are taught individually by methods suitable to their limited intelligence, and the results are good.

As far as the Education Department is concerned no steps have been taken, although the care of these children undoubtedly belongs to it, and although in other countries the educational authorities provide schools specially arranged for them.

The Lunacy Department does not deal with the feeble-minded, but with idiots and imbeciles, and has not attempted education in the ordinary sense of the term. All it aims at is to make the children cleaner, tidier, and more useful, as it cannot hope to fit them to take their places in the community as ordinary citizens or to make them self-supporting. What is done at Newcastle, therefore, is to teach them to assist in the domestic work of the hospital, in the sewing-room, tailor's shop, kitchen, garden, &c., and the more ornamental trades and occupations are not touched.

To prepare the children for the reception of their training and to draw out their dormant mental powers as far as possible, the Kindergarten system is employed.

When first instituted, the lessons were in the nature of object-lessons, and for many years the Matron, Miss Newton, carried these on in a manner which reflected great credit on her. Since 1908, however, trained kindergarten teachers have been employed with material advantages. At present two teachers—Miss Holden and Miss Johnson—are engaged in the work, and as they have not had previous experience with mentally-deficient children, the results are the more creditable.

The following extracts from a report by Miss Holden on the work will give a fair idea of the methods adopted :—

The kindergarten opened in February, 1908, with two classes of six children each and one teacher, the ages varying from 10 to 20 years. With the exception of one or two changes, the classes remained the same till June, 1909, when room was made for four boys of about 8 years. This made an average of eight in a class, which number has been kept up since.

In January, 1910, two extra classes were formed entirely of very young children from 3 to 10 years of age. This was brought about by the appointment of a second teacher, and the removal to a larger school-room.

In addition to the four kindergarten classes, a special class was formed in April, 1908, for girls who had had some education before entering the hospital. They have been taught fancy work, helped in their letter-writing, and encouraged to talk freely, and exchanged ideas; read to, and by pictures and conversation kept in touch with historical events such as the Coronation of the King and Queen. An effort has been made to develop them socially by taking them into our private rooms for sewing evenings, when they have been expected to take their share of social duties. Their appearance, manners, and speech have all greatly benefited from this.

The total number of children entered on the roll is seventy-five. Of these, forty are still on the roll, and thirty-five have been dismissed, ten because they were too old, ten left the hospital, and fifteen needed more individual attention before joining classes than it was possible to give.

Experience has shown that the best results have been obtained from young children of 3 to 10 years of age. These respond more naturally and quickly than those over this age. In order to give the needed individual attention, small classes have been proved necessary.

Froebel's Kindergarten educational methods have been adopted to meet the special demands and needs of the children. It has been necessary to start right at the very beginning in most cases, and very often to clear away a number of bad habits before any development was possible.

The chief difficulty has been a lack of even the simplest interests and knowledge resulting in a growth of bad habits. One child on first coming to kindergarten destroyed everything he laid hands on. He was made to mend these as far as possible, until in about three months he came to see more clearly the use and value of things. For three years he has not purposely destroyed anything in kindergarten.

Interests have been created by observation of surroundings—by pictures, stories, rhymes, songs, walks, Nature-study, and games. Kindergarten materials, blocks, drawings, &c., have been used as a means of expressing the interests thus formed. Knowledge of colour, number, and form have been obtained in the same way.

It has been necessary at first to study objects from every point of view, perhaps spending a whole morning on finding value, use, colour, form, and possibilities of a certain object. The only knowledge one class had of a water-melon was that it was something to eat. So we examined one, found different parts, colour, use, &c. of each, drew coloured pictures, modelled it in clay, and eventually found how and when it grew. Nearly a school year was spent on this one subject.

Another great difficulty, and one we have not been able to overcome yet, is the inability to speak. In several cases when the speech was clear enough, but disjointed and incorrect, improvement has come about as a natural result of mental development. But other children have come to kindergarten unable to say a word; all these have learnt to say a few words more or less distinctly, and some to frame small sentences. But all have come to look upon speech as the natural means of expression, and try to use it as such. This has been brought about mainly by expecting children to answer questions verbally, singing songs, and imitating sounds. Also a desire to talk has been created by the formation of interests, and as a means of relating their experiences.

The aim of our work is physical, mental, moral, and social development.

As a result of systematic and orderly games, marching, skipping, and other rhythmic movements, deportment has been improved, and varying degrees of muscular control gained.

All children have shown some mental development; as classes they are more orderly, attentive, observing, and thoughtful. They have gained in power of concentration, gained knowledge of relationships, understanding things not as separate objects but as things of relative value.

We have tried to eliminate the spirit of competition, and put that of co-operation in its stead. When first they came to kindergarten, they ridiculed those who were unable to do things, now they are always ready to assist each other. They have learnt to distinguish more clearly between right and wrong.

Each child is expected to take his part in the housekeeping duties, which include tidiness of school-room, tables, and bath-room; preparing tables for eleven o'clock lunch: washing up, and putting plates and mugs away. Their own appearance is also looked to, and good personal habits are gradually being formed.

The children have their own little garden in which they have taken great interest, and at the end of last year were very proud that they had their own flowers to decorate their tables of work for the Christmas-tree. They also have a canary which they look after every morning, never forgetting seed or water.

It is always easier to explain such matters by demonstration than by description, and I have arranged for the teachers to show you the work in operation, with a class of boys which includes samples of all ages and of various mental capacities. It is desired to impress on you that these classes are not to be judged by the amount of knowledge acquired by the children. They have not been introduced with a view to educating them, using the word in its ordinary significance. The classes are rather part of the institution life, and take their share in increasing and enlarging the mental powers of the children, and making them more capable of acquiring habits of industry, order, &c., which the institution life offers—in other words the work is not to be compared with that of institutions for the feeble-minded which deal with children of higher intelligence.

The exercises to be shown are only a small number of those in operation in the hospital. Those chosen are the ones which are the more easily demonstrated to onlookers, but samples of the work done with the children in other directions are also available for inspection. The selected exercises are specially intended for developing the especial senses.

PLAN FOR DEMONSTRATION.

- | | |
|-----------------|------------------------------------|
| 1. Marching. | 4. Bead-threading. |
| 2. Sense games. | 5. Gift play, building blocks, and |
| 3. Songs. | raffia work. |

AIMS AND PURPOSE OF ABOVE.

1. Marching is a means of obtaining orderliness, discipline, and prompt obedience. It might be interesting to add that eighteen months ago these children could not follow a leader without holding each others coats, or all holding a rope.

2. Sense games develop senses of hearing, feeling, and seeing. Incidentally the children acquire a knowledge of the names and qualities of articles.

4. Bead-threading gives an accurate knowledge of colour and form.

5. Gift play is a means of expressing various experiences. The one chosen illustrates the story of "The Three Bears." Habits of orderliness, accuracy, and quickness are all encouraged by this means.

DISCUSSION.

Subsequent to the Clinical Demonstration, a discussion on the subject of the Feeble-minded was taken part in by Dr. Mary Booth (Melbourne), Dr. Ernest Jones (Melbourne), Dr. Crowther (Hobart), Dr. Adey (Ballarat, Victoria), and others, and the following resolutions were agreed to :—

A.—“That this Congress advise each State Government to inquire as to the number of feeble-minded children needing special education, and to take steps for the provision of such education.”

B.—Resolution moved by Dr. Mary Booth, Melbourne, and seconded by Dr. Ernest Jones, Inspector-General of the Insane, Victoria :—

“That it is desirable that a popular campaign should be initiated throughout the Commonwealth to educate the people on the problem of the Feeble-minded.”

“That the Section recommends the appointment of a Committee representative of each State. The State representatives shall have power to add to their number locally.”

“These Committees to report to a Central Committee, which will be responsible for deciding on the details of the information to be obtained, and for tabulating the returns.”

Resolution moved by Dr. Mary Booth, and seconded by Dr. Eric Sinclair, Inspector-General of Insane, New South Wales :—

That the State representatives be as follows :—

Victoria ...	Dr. J. Sandison Yule..
New South Wales	Dr. Andrew Davidson..
Tasmania ...	Hon. Dr. G. H. Butler..
South Australia ...	Dr. E. Rogers..
Queensland ...	Dr. Eleanor Bourne..
New Zealand ...	Dr. Valintine..
Western Australia	Dr. S. H. O. Montgomery..

and that the Central Committee be composed of :—

Dr. W. Beattie Smith..	Dr. J. Sandison Yule..
Dr. Ernest Jones.	Dr. Mary Booth.
Dr. Harvey Sutton..	

ON TABES-LIKE SYNDROMES IN INFANCY.

By PROF. H. OPPENHEIM, Berlin.

BESIDES infantile tabes and Friedreich's hereditary ataxia there occur in infancy complexes of symptoms, which, in spite of their external relationship to these affections, must be separated from them.

I have had the opportunity of observing two such types, hitherto not described. In both there existed states, which had developed upon the basis of the congenital diathesis and of the toxicopathic heredity (saturnism and alcoholism of the parents).

The first type is characterised by the fact, that in infancy or boyhood a unilateral ataxia develops, affecting first the leg, then the arm, and slowly increasing in intensity. The objective examination reveals a hemiataxia combined with hypotonia, loss of the tendon reflexes, and anæsthesia either for all qualities or particularly for the tactile sensibility and the sensation of position. The picture corresponds to that of a unilateral chronic-progressive posterior tract degeneration.

In the second type we have to deal with a congenital disease presenting the following symptoms:—Hypotonia of the legs with suspended tendon reflexes, static and motile ataxia in the legs, less so in the arms, and a slight degree of arrested mental development. The symptoms point to a congenital hypoplasia of the posterior tract systems.

My experiences teach, that in children of non-luetic parents a germinal lesion may produce states of disease, which are similar to, but not identical with, tabes.

VALUE OF VON PIRQUET'S TEST IN PSYCHIATRY.

By J. CATARINICH, M.B., Ch.B. (Melb.).

Junior Medical Officer, Hospital for Insane, Sunbury.

NOWHERE in practice will a medical man meet with more difficulty in the diagnosis of tuberculosis than among the insane. Satisfactory examination is frequently impossible for several reasons—the history obtainable may be nil; physical examination may give very little assistance, owing to the mental state of the patient—negativism or restlessness, mutism, shallow breathing, and so forth, all render the examination difficult; sputum is frequently swallowed or deposited anywhere but in the proper receptacle. It will be generally conceded that early diagnosis is very necessary, yet there can be no doubt that in a large majority of cases when detected, the disease is already advanced.

Recognising these difficulties, I have endeavoured to formulate some value for the Von Pirquet test, and incidentally to bring forward a few ideas suggested by the results of the examinations made.

Method.—The usual method of applying the test was followed. The skin of the forearm was the seat of application. Koch's old tuberculin (as supplied by Parke, Davis, & Co.), was used in undiluted form. The skin was first washed with soap and water, then with ether. I make the control scratch first and then scarify in the drops of tuberculin. No control fluid was used—in my opinion it serves no purpose.

Advantages of the Test.—The cutaneous test possesses many advantages, there are no contra-indications to its use; it is quite harmless, it can be done on practically any class of patient; it gives very little pain, and it is unattended by the constitutional and local disabilities of the tests by injection and by Calmette's method respectively. I dislike Calmette's method owing to the frequency with which one meets with eye troubles among the insane.

The Reaction.—The main reaction in positive cases was a small papule with a surrounding area of hyperæmia—very rarely secondary papules formed, which is rather contrary to the generally accepted idea. Occasionally the lymphatics showed up as red streaks. In some cases, most of whom I could definitely associate with alcohol, there was practically no hyperæmia, but a large indolent whitish-grey tubercle formed promptly and persisted for some days:—the want of hyperæmia suggests lowered resistance to the B. tuberculosis, as will be seen later on. Two glandular cases reacted vigorously. One case of miliary tuberculosis gave no reaction.

Value of Test diagnostically.—A positive test points to a definite tubercular lesion be it active or quiescent. A negative reaction excludes such lesion with certain exceptions, viz.:—Miliary tuberculosis (acute) and advanced phthisis.

I regard the negative test as even more valuable than the positive one—it is definitely exclusive except in cases which present, as a rule, little difficulty. The great objection to the positive reaction may be termed the "clinical negative" *i.e.*, cases clinically negative may give a positive reaction. Personally, I do not see much in the objection:—a positive reaction in such cases simply means a quiescent focus. Every case of active tubercle gives some kind of symptom or symptoms, hence they cannot be termed "clinically negative." Even in the insane it is some such sign or symptom as evening temperature, refusal of food, wasting, &c., which may first direct attention to an active tubercular focus, and in such cases clinical negation may exist even though one feels sure that the disease is becoming active. It is here, *i.e.*, in cases of doubt, that I feel sure that the Von Pirquet test is invaluable.

Confirmation of the Test.—That a positive reaction indicates a tubercular focus was confirmed by the following facts:—Forty patients reacting positively were given injections of tuberculin, ranging from 1 to 5 milligramme doses. Thirty-eight gave definite rises of temperature; two were doubtful—I say "doubtful" because the normal temperature of an insane person is hard to gauge—it is significant that one of these two reacted vigorously and the other slightly with the Calmette reaction.

These same forty patients gave the "Evans-Whitney" reaction (1), *i.e.*, hyperæmia following injection of a drop of 1 in 5,000 old tuberculin into the upper layers of the cutis.

Thirty-one positive and eight negative patients were submitted to the Calmette reaction. None of the eight reacted, of the thirty-one, nineteen reacted markedly, five slightly, and seven not at all. Wolff-Eisner (2) who claims this reaction as his, explains this discrepancy by stating that quite inactive foci do not give the conjunctival reaction.

Thirty-four patients reacting positively have at some time during their residence here been under treatment for apparent tubercular lesions as evidenced by hæmorrhages, evening temperature, cough, wasting, &c.

Twenty-two patients reacting positively were found to have evening temperatures (not necessarily tubercular) varying from 99 degrees to 102·2. Eighteen patients have died since the inauguration of the tests. Three had reacted positively and exhibited tubercular lesions *post mortem*, viz. :—(1) Obliterated fissure and a fibrous tubercular nodule about the size of a cherry between the upper lobes of right lung; (2) numerous small tubercular foci throughout both lungs; (3) fibroid phthisis right upper lobe, and a small patch at left apex.

Fifteen were negative, fourteen showing no macroscopic tubercle, and one miliary tuberculosis.

Value of the Test prognostically.—My experience is not sufficient to be dogmatic, but such as it is it agrees with Wolff-Eisner's statements (2) briefly these are—no reaction with definite tuberculosis, prognosis bad; early poor reaction disappearing rapidly, prognosis poor. The more marked the reaction, the later it appears; and the more lasting it is, the better the prognosis.

Value of the Test prophylactically.—Patients reacting positively can be segregated and roughly classified according to the reaction given. There can be no doubt that any increase in tuberculosis among the patients residing at this asylum is traceable to three causes :—(1) Spitting; (2) exposure; (3) overcrowding; the last, however, has greatly been mitigated. The last two causes are, to a large extent, dependent on expectorating. With segregation, any increased risk to negative patients would be practically excluded.

Summary of Cases.—825 patients were submitted to the test; of these 244 reacted positively. Classification and percentages are set out in the following table :—

Classification.	Tests.	Positive.	Percentage.
Imbecility	81	29	35·8
Insanity with epilepsy	17	3	17·64
Mania	58	12	20·68
Melancholia	29	12	41·37
Hypochondriasis	4	3	75
Alternating insanity	3	...	...
General paralysis	5	1	20
Delusional	70	20	28·57
Dementia, primary	59	35	59·32
Do senile	51	14	27·45
Do secondary to mania... ..	126	26	20·63
Do secondary to melancholia	57	23	40·35
Do secondary to delusional insanity	78	19	24·35
Do unclassified	187	47	25·13
Total	825	244	29·57

It will be seen from the above table that three classes of patients are apparently especially liable to infection by the B. tuberculosis, viz. :—Melancholia (with its dementia), imbecility, and primary dementia. Further, dementia following on other classes of mental disease shows no such liability. One is tempted to ask, "Is there any relationship

between these three classes of mental trouble?" With the meagre evidence I can produce it would be absurd to make a definite reply; nevertheless, I feel there is more than mere coincidence to explain the common liability.

Firstly then, I have always looked upon primary dementia as a kind of delayed imbecility—indeed, given a later stage of primary dementia, one might casually dismiss the case as one of imbecility. As regards melancholia, I believe that the true type of disease is one of involution, usually occurring at about the age of 40, and characterised by premature senility and arterio-sclerosis—it may be associated with the climacteric in women, and it may occur at an earlier age under the influence of phthisis. These three types then are degenerative from the outset—imbecility, with no hope of recovery; primary dementia, rarely recovered from; melancholia, more hopeful, but ever threatening recurrence and dementia.

Now it is in degenerative families that phthisis is rampant, I therefore looked up those cases in which there was a family history of lung trouble. I found thirty, and the mental state of these patients was nineteen melancholia, four congenital mental deficiency, four primary dementia, one general paralysis, one epileptic, and one delusional. In this last case the only history of phthisis was its occurrence in an uncle—otherwise the family were healthy. The remaining cases are distinctly degenerative, and peculiarly enough melancholia, imbecility, and primary dementia predominate. In a few cases imbecility and melancholia occurred in the same family. The following is a good instance:—

M.G., aged 27, suffering from agitated melancholia. Paternal grandfather was insane; paternal uncle died of phthisis. Maternal grandfather alcoholic. A sister and a brother have phthisis. One brother imbecile, and three other children highly strung and nervous.

Here apparently, under the same conditions, imbecility and melancholia were begotten, while phthisis flourished in a similar soil.

In the four cases of primary dementia there was no history other than one of phthisis. Latterly, in a few cases of like character, I have been unable to trace any degeneration in the antecedents except a history of lung trouble. Although defective heredity appears to be the main etiological factor in these cases, still I am inclined to think that phthisis even of itself may give rise to primary dementia in the offspring. Intimately associated as it is, with degeneracy, are we, by prevention and better treatment, decreasing phthisis in the younger generation, only to pave the way for primary dementia to play its full part after a comparatively short interval?

Summing up then, my conclusions are—

- (1) Phthisis is intimately associated with degeneracy.
- (2) It may directly induce insanity, degenerative in type.
- (3) Certain forms of insanity are especially liable to phthisis.
- (4) These same forms may apparently be indirectly induced by a phthisical inheritance, and they are possibly related to one another.

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THE EXAMINATION OF THE BLOOD SERUM OF IDIOTS AND IMBECILES BY THE WASSERMANN REACTION.

By J. FROUDE FLASHMAN, M.D., B.A., B.Sc., (Syd.).

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IN view of the interest naturally attaching to the question as to what influence syphilis in the parents can have in the production of idiots and imbeciles, I determined last year to subject the blood of every individual inmate of the Newcastle Hospital for the Insane, an institution which receives only idiots and imbeciles, to the Wassermann reaction. The method adopted was the original one, except that we used always the following quantities:—

S	C	E	KI
5	10	20	20
‘I.C.C.	‘I.C.C.	‘I.C.C.	‘I.C.C.

The extract we used was an alcoholic extract of foetal liver, an extract which we have repeatedly tested and found to be of particularly good quality. To those who are not particularly acquainted with the value of this reaction and the conditions under which it can be expected to give a positive result, it should be explained that in congenital specific disease one expects to find the reaction in a high percentage of cases during the earliest periods of life, and that, later on, experience goes to show that the percentage of positive results rapidly diminishes. The exact position of this question cannot be fully considered here, but it may be stated that undoubtedly one comes across individuals of 20 or 30 years of age showing undoubted specific lesions in whom the Wassermann reaction is found to be negative. Many cases also, though known to be suffering from congenital syphilis, never give a positive Wassermann reaction. Under these circumstances the determination of the number of individuals in any given institution showing a positive reaction has no exact statistical value so far as etiology is concerned. At the most it can only be said that the number showing positive results indicates the minimum number of congenital specific cases in such institution. The actual number can never actually be determined, and any estimate that might be made, based on the findings of the Wassermann reaction, must vary to a tremendous extent, according to the bias of the individual preparing such estimates.

It should be said that the investigation was carried out in complete ignorance of the results obtained by other investigators doing similar work. Further, the work occupied some months, batches of tubes being forwarded to the laboratory periodically. Those of

us in the laboratory had no knowledge of the clinical cases, and no idea was formed until the completion of the investigation, when the records were overhauled and the figures estimated.

In the *Lancet* last year, Dean, in publishing the results of a similar investigation conducted in an asylum near Potsdam, gives a good bibliography of similar investigations.

Dr. Rabiart and others examined 246 cases, and found that 76, or 30.8 per cent., of these gave a positive reaction.

Kellner and others examined 216 cases, with a maximum of 16, or 7.4 per cent. positives.

Lippmann examined 78 cases, finding 7 positives, which equals 9 per cent.

The figures given for Dalldorf Asylum are 13.2 per cent.

Dean's own cases numbered 330, with 51 positive results, a percentage of 15.4. Our own investigations were conducted on a material numbering 436 individuals. Of these we found that twenty-nine gave an absolutely positive reaction, and that in fourteen others binding took place to such an extent that those of us in the laboratory who had had the longest experience were of the opinion that it indicated specific affection. We are, therefore, inclined to consider that we obtained by this test evidence that in this institution forty-three individuals were proved to be the subjects of congenital syphilis. This number represents 9.8 per cent., a figure which approximates very closely to those obtained by Lippman and to those obtained by Kellner and others. It might be thought by some to be of interest to take the percentage of all the cases published; but on examining the results obtained it is evident that the findings of Rabiart and his colleagues differ so widely from those of all other investigators that the idea arises that the problems in the various cases have been solved by varying means. The Wassermann reaction is not an absolute thing. The results must always be the results, to some extent, of varying factors, including the personal one. In averages it is held that extreme cases should be eliminated, and if this be done in this case one finds that the average number of inmates of institutions for imbeciles and idiots who give a positive Wassermann reaction is about 10 per cent. This 10 per cent. finding represents, we believe, the actual minimum. It is extremely probable—in fact, absolutely certain—that the percentage is much higher. Of course our findings prove nothing. They furnish a set of facts for the service of those investigating the ætiology of imbecility and idiocy. There was presumption that syphilis plays a very important ætiological part, but it is not yet proved.

A SHORTER MODIFICATION OF WASSERMANN'S SERUM TEST, WITH CRITICISMS.

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THE Pathological Department regularly does Wassermann's test for the bloods of patients in the various hospitals for insane and elsewhere. As the method demands not only time, but certain materials such as fresh sheep corpuscles and guinea-pig serum, it is usually done but once a week. Now, it may happen that one may need an opinion on days other than that one. Some inconvenience might be avoided by using a human blood rabbit hæmolytic system, but we did not succeed in obtaining a good immune body from this way. A method described by d'Este Emery recently in the *Lancet* for 1st March, 1911, gave certain ideas which seemed applicable to out-patients' departments, as it could be done in forty minutes, sometimes less; and with the object of testing its applicability, various experiments were carried out with bloods of patients at the same time as they were being examined by the longer original Wassermann method, in which natural complement in the sera is not used, but that from the guinea-pig, after the sera to be investigated has been inactivated.

In the first place we found it correct that any sensitised corpuscles diluted 1 in 20 left over from the original Wassermann process kept perfectly on ice for seven to ten days, and this did away with the necessity of getting fresh sheep's corpuscles daily; also that it was correct that antigen linked to antibody in less than ten minutes in a water-bath at 37 C.

d'Este Emery further says that sufficient complement is present in all blood not kept too long to act, without going to the trouble of inactivating the serum and adding complement from a guinea-pig, perhaps itself deteriorated. Obviously if all these three principles were found the rule, his shortened method would prove of great service, and to this end a series of tests were carried out in the following way:—Two tubes, A and B, were obtained, and a definite quantity, say, 1 c.c. of unheated serum diluted 1 in 5 of 9 saline added to each; next 1 c.c. of 9 saline was added to A, and to B was added 1 c.c. of extract (antigen), suitably diluted (see afterwards). These tubes were then placed in a water-bath at 37 degrees C. for ten to fifteen minutes, and then 1 c.c. of sensitised corpuscles diluted 1 in 20 of 9 saline added to each, and shaken and replaced in the water-bath. The object of having the extra tube A was to prove that sufficient complement was present to begin with, to hæmolyse the corpuscles when the extract was not there. As a rule, tube A hæmolised in fifteen to twenty minutes, and tube B, if the case was negative, almost as soon. If tube A showed the slightest binding,

that serum had not enough natural complement preserved to successfully perform the test, and was rejected. The readings were taken in half an hour and at the hour.

We performed 127 serums this way, and with the original Wassermann method, and had to reject fifteen, as they did not contain enough complement as proved by tube A. Of the remaining 112, sixty-six gave negatives, all corresponding with the results obtained by the old Wassermans, while thirty-five gave positives—that is, binding—of which eleven did not agree with the original Wassermann's—that is, 33 per cent. In some of these cases, the test was repeated with the extract half as strong, but without altering the result. Thus, while this method gives equally accurate results with cases that are negative syphilitics, yet 33 per cent. of the positive findings fail to tally with the original Wassermann's and positive findings had better be reserved for retesting with the older method.

Some reasons for these discrepancies. Our immune body is obtained by injecting a rabbit with 50 cc. of washed sheep's corpuscles in .9 saline several times. Sufficient immune body is added to fresh sheep's corpuscles to give them a titre such that, if the blood corpuscles obtained from a definite quantity of whipped blood be thus sensitised and diluted twenty times with .9 saline, the .03 c.c. of fresh guinea-pig's serum diluted 1 to 10 (complement), added to .1 c.c. of these diluted sensitised corpuscles and .9 saline, added up to .55 c.c., causes complete hæmolysis in twenty to twenty-five minutes, while .02 of complement but partially hæmolyses as a rule, while .01 hardly ever does. Thus we are dealing with corpuscles sensitised to a relatively definite titre.

Again, antigen is tested every time a test is done against a known normal and syphilitic serum, having discovered by practice previously what dilution on the one hand easily permits complement in the presence of inactivated serum of pooled controls to hæmolise these sensitised corpuscles, and on the other hand quite binds complement in presence of same quantity of inactivated pooled serum of definite syphilitics.

Lastly, even guinea-pigs' serum diluted 1 to 10 deteriorates in twenty-four hours to some extent. It would appear, therefore, that in this country there are degrees of deterioration in the natural complement in blood after removal from the body, which, on the one hand may permit absolute hæmolysis in both tubes, and on the other hand allows binding in the both tubes. In these intermediate stages there is sufficient complement present to hæmolise the control tube, and therefore prevent the test being rejected, and yet, in the presence of extract, binding to a greater or less extent with sera, which give absolute negative bindings with the original Wassermann's. We admit that the author of the method says he sensitises his corpuscles so much that they hæmolise to a trace of complement; it is difficult quite to define what is meant by a trace. When we use sensitised corpuscles one can say definitely .03 c.c. of complement

will bind completely, and .02 c.c. just will not, and in practice we often get slight reactions where serums hardly bind with .1 c.c. of complement, and yet do almost fully with .07 c.c. Again, the author says "it all turns on the strength of the antigen." But if one diluted the antigen down, many mild reactions in cases of syphilis would be missed. This we found when we tried to use a more diluted antigen than that found by experiment to give a fair margin between normal and syphilitic sera.

Lastly, we have tried alcoholic extracts from innumerable syphilitic livers, with and without spirochætes, and normal hearts, cholesterin, lecethin, &c., and only found two satisfactory. The others either did not differentiate at all, or else bound both with normal and specific sera, even in dilutions of 1 to 50, and even then the differentiating properties were not marked. In the two good extracts, a dilution of 1 in 5 and 1 in 10, respectively, fails to bind with a normal sera at all, while diluted 1 to 30 completely binds with average syphilitic sera, using the amount .1 c.c. of all the interacting substances, and both livers contained spirochætes.

In conclusion, the method as used by us is quite satisfactory, provided the result is negative, but if a positive binding is obtained, these are unreliable, and had better be redone by the older and longer method, although, perhaps, where the blood is not more than two hours drawn, results would be far more accurate. We only used sera under thirty-six hours old, kept on ice. They were mostly under ten hours old. Pooled syphilitic sera should be used, because some general paralytics, blood will bind three or four extra doses of complement, and dilutions of extract capable of binding with this sera would not necessarily bind with sera containing fewer antibodies; one extract might in certain dilutions appear quite satisfactory, unless tested in this way. In this shorter method, using weaker or stronger dilutions of extract is the only means at our disposal to modify the strength of the reaction, and even then we do not know the amount of complement present in the serum unless the blood be just drawn, when we might gauge it, while in the original method both serum, or complement, or antigen can be varied in amount to test the strength of the reaction. We commonly use .1 and .07 c.c. of complement, and sometimes find a G.P.'s blood will bind .4 c.c. of complement.

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ON THE PRACTICAL SIGNIFICANCE OF THE USE OF THE SO-CALLED "FOUR REACTIONS" FOR THE DIAGNOSIS OF SYPHILITIC ORGANIC NERVOUS DISEASES.

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THE results of investigations as to (a) lymphocytosis, (b) increase of albumin in the cerebro-spinal fluid, and (c) the existence of the Wassermann reaction (W.R.) in the blood, have in recent years been used by neurologists of all countries for the differential diagnosis between syphilitic affections and other diseases of the central nervous system. These attempts have greatly advanced our knowledge. The statements of the French (particularly of Vidal, Ravaut, and Sicard) have been generally confirmed. The investigation as to increase of albumin in the cerebro-spinal fluid, introduced by Nissl, has been made easy by the so-called "phase I" reaction, introduced by myself and Apelt, and tested by us on a large number of patients. I first published this reaction four years ago, and its value has since been confirmed by many authors, so that it may now be regarded as generally accepted in the diagnostic methods of neurology. The W.R. in the blood can no longer be regarded as specific, but only as characteristic, of syphilis, for it has been stated by many authors that it also occurs in a certain percentage of some tropical diseases such as leprosy, malaria, and of recent cases of scarlatina. The examination of the cerebro-spinal fluid for the W.R. has become of greater importance since Hauptmann and Hoessli in my ward introduced the use of increasing quantities of the cerebro-spinal fluid. I also have tested and determined the value of this method on the material in my ward. It cannot be denied, however, that some theoretical questions still require solution, and that final and definite deductions, drawn from all the results, cannot for practical use yet be stated. On the other hand this question has reached a certain finality in so far that anyone who can use the "four reactions" and interpret them correctly may by their means clearly diagnose cases which are clinically doubtful. During the last four years I have occupied myself almost uninterruptedly with these reactions, as they from time to time appeared in literature, and have tried to solve the questions, as they presented themselves, on the abundant material at my disposal in hospital and private practice. I specially tried to ascertain how far the result of the "four reactions" would admit of definite conclusions for practical use.

The *technique of lumbar puncture* is comparatively simple, and is as follows:—In the middle of a line connecting the crests of iliac bones a puncture is made between the laminae of the third and fourth lumbar vertebræ by means of a canula and trocar. It is best to let the patient lie on his side during the operation; I myself prefer to let him lie on his right side. The pressure of the fluid as it escapes is measured by a vertical glass tube, graduated in mm. The pressure is in normal adults about 130 mm. A quantity of 5 cc. of fluid is sufficient for the purpose of testing the reactions, for one should take as little as possible to avoid disagreeable complications, which will, however, occur

now and then in spite of all precautions. These occasional disagreeable consequences consist of headache, nausea, and vomiting. The quieter the patient is kept after the lumbar puncture the less will be the liability of troubles arising from this trifling operation. (Experience goes to show that paralytics and tabetics are in almost all cases free from subsequent troubles). As a precaution it is advisable, for twenty-four hours after the operation, to allow the patient to lie quietly in bed on his back with head low, and not allow him to get up during this time, even for the performance of his natural functions. If one omits these precautions most disagreeable consequences may arise, for the patient may suffer for days, and even weeks, from headache, giddiness, and nausea. To perform the puncture in the consultation room (as has been done) is absolutely to be condemned, because the doctor may be held liable for any possibly disagreeable consequences; I have myself experienced this in a case to my cost. The cerebro-spinal fluid usually flows as clear as water, but it sometimes happens, in spite of great practical experience, that a small vein is punctured, and some blood mixes with the fluid. It goes without saying that such fluid is useless for an estimation of increase of either albumin or white cells, but a slight admixture of blood does not interfere with the W.R.

The simplest *method of testing the cerebro-spinal fluid for albuminous bodies* is to search for an increase of globulin—the so-called “phase 1” reaction introduced by myself and Apelt. For this purpose there is added to a hot saturated solution of sulphate of ammonia an equal quantity of fluid; 1 cc. of each is quite sufficient. It is advisable to pour one liquid gently on top of the other; if the globulins are increased there occurs a more or less distinct grey ring at the plane of contact. After this preliminary observation the mixture is well shaken and the result may be read off within three minutes. If it is distinctly opalescent or cloudy we call it a positive “phase 1” reaction.

For the *examination of the cerebro-spinal fluid as to an increase of cells*, we found the Fuchs-Rosenthal counting-chamber best. It is somewhat larger than the one generally used to count the red and white blood corpuscles. The counting is performed as follows:—The staining fluid (0.1 g. methyl violet, 2.0 g. glacial acetic acid, 50 g. distilled water) is drawn up by the pipette, in general use for counting the white blood cells, to point I, and then further filled to point XI. After shaking the pipette for five minutes, a drop of the mixture is put on the counting-chamber. One counts all the lymphocytes and leucocytes in all the squares, and divides the number ascertained by three. Our experience taught us that one may regard from 0 to 5 cells per cmm. as normal, 6 to 10 as borderland, while more than ten cells per cmm. constitute pathological increase.

The technique of *obtaining the blood for the Wassermann reaction* is very simple. A “Bier” ligature is tied around the upper arm so firmly that the veins of the forearm fill tensely, but the pulse at the wrist is still palpable. The canula is then introduced from above, so that the venous blood may escape in its natural direction, and 5 to 10 cc. of blood are taken. The blood is then thoroughly stirred with a glass

rod to facilitate the separation of the serum, and this stirring is repeated at intervals of half an hour until the process is complete. It is then preserved on ice until it is to be used for W.R.

I do not intend to describe the technique of the W.R. in detail. It is best performed in large institutions on account of the serological training and the number of controls required, which are possible only in such places. But I consider it necessary to shortly recall the history and character of the reaction. Wassermann started from the Bordet-Gengou doctrine of the complement-deviation by known micro-organisms, and tried to apply this phenomenon to diseases the organism of which is not yet known, or at any rate has not yet been grown artificially. He used in the place of pure cultures of micro-organism, organs which either may or may not with certainty contain the organism of the disease in question; for instance, in syphilis, the liver of a luetic foetus plentifully pervaded with spirochætes. After having completed his preliminary investigations he published, together with Neisser and Bruck, the well-known reaction by means of which one can prove that an individual, at some time during his life, has been infected with syphilis. The original method has in due course of time proved best, although several authors have proposed modifications.

From the liver of a luetic foetus a watery extract is prepared, and if this is added to the serum of a syphilitic individual it is able to detach the complement from the hæmolytic system (consisting of sheep's blood corpuscles and guinea-pig serum as "complement," and of the serum of a rabbit previously treated with sheep's blood as "amboceptor"), and thus to impede the combination of the system and the resultant hæmolysis.

In order to better understand the reaction I will show the following table:—

WASSERMANN-NEISSER-BRUCK, SYPHILIS REACTION.

Components—

- | | |
|--|---------------------|
| (1) Sheep's blood corpuscles. | } Hæmolytic system. |
| (2) Amboceptor. | |
| (3) Complement. | |
| (4) Antigen. (Extract from organ.) | |
| (5) Liquid to be examined (serum or cerebro-spinal fluid) containing antibodies (?). | |

These components are prepared as follows:—

- (1) Sheep's blood corpuscles are freed from all serum-elements by centrifugation with sod. chlor.
- (2) Rabbit serum previously treated with sheep's blood.
- (3) Freshly obtained normal guinea-pig serum.
- (4) Watery or alcoholic extract of a hereditary-luetic liver (or of a normal heart).
- (5) Serum freshly taken or kept sterile by preservation on ice, and obtained by simple separation from the blood to be examined.

Principle of the Reaction.

Two interactions ("ring") may occur between these components—

- (a) Sheep's blood corpuscles are, in the presence of complement, dissolved by the amboceptor (hæmolytic system), or
- (b) A second interaction occurs between antigen, antibody, and complement.

If antibodies exist in the serum to be examined they attract to themselves, in conjunction with the antigen, the complement, so that the first interaction cannot take place from want of complement, and consequently the blood corpuscles cannot be dissolved.

1 and 2 and 3 = the first interaction.

3 and 4 and 5 (?) = the second interaction.

Positive Reaction.

1 and 2 (3 participates in the second interaction; the first interaction does not occur; the blood corpuscles remain undissolved).

3 and 4 and 5 = the second interaction.

Negative Reaction.

1 and 2 and 3 = the first interaction (hæmolysis).

3 participates in the first interaction, for from a second interaction only 4 is present, while 5 (antibodies) is not present in the non-luetic serum.

Technique of the Reaction.

The serum to be examined is placed for half an hour in the incubator at 55° C. (131° F.), to destroy its own complement. Serum (antibodies?), antigen, and complement are mixed, and placed for one hour in the incubator at 37° C. (98·6° F.), so that the second interaction may occur. Then, after the addition of amboceptor and blood corpuscles, the mixture is again put for two hours in the incubator, so that if the second interaction (from want of antibodies) has not occurred (the complement thus not having been used up) the first interaction may occur (hæmolysis).

The nature and significance of the fixing elements contained in the serum of syphilitics is not yet clearly understood, and this is also the case in regard to the active elements in the extract of the luetic liver. Wassermann, Neisser, and Bruck originally assume that we have before us a specific antibody-reaction. Bruck still adheres to this view, though objections have been raised to it as follows:—

- (a) A reaction of equal effect has been obtained when the extract was made from normal organs instead of from luetic liver. The luetic liver extract could also be replaced by other substances which normally exist in the organism, and which can be manufactured chemically pure.

(b) As I mentioned in the introduction, it has been proved that the W.R. cannot be regarded as absolutely specific in the clinical sense. It has been occasionally demonstrated in leprosy, malaria, frambœsia, recurrent fever, and, perhaps, also in marked cachexia associated with tuberculosis, diabetes, &c. It has recently been asserted that the serum of plague cases also shows positive W.R. The occurrence of this reaction is, however, not constant in these diseases, and depends greatly on the quality of the extract. There exist extracts which are excellent to prove a previous syphilitic infection, but which nevertheless yield no positive reaction with scarlatina serum, while others react beautifully both with the serum from scarlatina and from syphilitic patients. In scarlatina—the only disease which in our latitudes (Germany) need be considered in the differential diagnosis—the positive reaction further depends on the disease being of recent date, for after four weeks at the most the serum of a scarlatina patient loses the power of diverting the complement of the hæmolytic system. Taking all the above circumstances into consideration it is hardly admissible to speak of the reaction as specific in the clinical sense; it can only be described as characteristic. It is, however, not intended, by this statement, to restrict the practical usefulness of the W.R.

What does the increase of the lymphocytes (pleocytosis) in the cerebro-spinal fluid prove? Pleocytosis occurs in about 95 per cent. of syphilitic and metasyphilitic affections of the central nervous system, but may also be noted in other organic non-syphilitic nervous diseases, though less frequently, and only quite exceptionally with great intensity. In genuine syphilitic, and still more so in metasyphilitic diseases (general paralysis and tabes) of the nervous system, the lymphocytosis is intense, or even very intense (50 to 300, even to 600 and 900 lymphocytes in the field of vision).

Of great importance is the fact first stated by Apelt, that individuals who have once been infected by syphilis may show a weak or moderate lymphocytosis even in the absence of any clinical symptoms of organic nervous disease. According to our statistics it occurs in about 30 per cent. of the cases. We may well conclude, therefore, that the finding of lymphocytosis, especially if it is of great intensity, must point with great or even very great probability to the existence of a syphilitic organic nervous disease, but it does not prove it with certainty.

The *Phase I reaction* may occur in all organic affections of the central nervous system. Like lymphocytosis it also is observed almost without exception (95 per cent., and some authors state even 100 per cent.) only in syphilogenic diseases, both syphilitic and metasyphilitic. But whereas lymphocytosis occurs, in addition, in persons who were once infected with syphilis, but do not suffer from organic nervous disease, a phase I reaction occurs exclusively in patients with organic nervous disease; it is never observed in persons who have once been infected by syphilis, and suffer now only from a functional neurosis (general nervousness, neurasthenia, hypochondriasis, &c.). This important fact enables us to decide the diagnosis in cases which frequently occur in practice, and in which we have to face the question whether it is an early stage of general paralysis

in a luetic individual, or neurasthenia, or simple nervousness, or sub-maniacal phases of a circular psychosis in luetic persons. In all such cases the phase 1 reaction will not be positive so long as it is not a case of general paralysis. On the other hand, however, the "phase 1" reaction is unable to assist the differential diagnosis between a non-syphilitic organic cerebral or spinal affection and a syphilitic nervous disease: for instance, it cannot help us towards a decision between multiple sclerosis and cerebro-spinal syphilis.

The W.R. in the blood has been greatly overestimated. We must clearly understand that it can tell us no more than that the individual has at one time been infected by syphilis; but according to the opinion of most authors the reaction is unable to indicate whether the individual still carries spirochætes, or whether the body somewhere still contains syphilitic products which are not yet manifest clinically. The reaction is entirely unsuited to tell us whether in a person with an organic nervous disease the latter is of a syphilitic nature or not. The W.R. of the blood, therefore, aids us practically only in so far as to enable us to determine the former infection in spite of a negative history, or in the absence of somatic signs. By this means the diagnosis as to a syphilitic nervous disease becomes in many cases much more probable, but this is *all* that the reaction can do. I may further state that the absence of the W.R. in the blood by no means excludes the possibility of a syphilitic disease. I need only point to tabes dorsalis, in which, according to statistics in all countries, the reaction is absent in 30 to 40 per cent., *i.e.*, it is present only in 60 to 70 per cent. There are also many cases of genuine syphilitic diseases of the brain and spinal cord where this reaction is absent. This absence has an evident differential-diagnostic value only in regard to general paralysis. I have published my investigations in this direction in the Jubilee paper to mark the 60th birthday of Professor Unna. Many authors have stated that this reaction occurs almost without exception in general paralysis, certainly in more than 95 per cent. When this reaction is, therefore, not found, we may justly doubt the correctness of the diagnosis—General Paralysis. I have further proved that if one estimates the W.R. in the blood (by a procedure introduced by Zeissler in the laboratory of Much) for higher degrees, one seldom receives any low values in paralysis. If we establish 5 degrees of intensity of the W.R. in the blood (the weakest being 1, the strongest 5) the degrees 5 and 4 are by far the most frequent in general paralysis, degree 3 is still fairly frequent, while degree 2 occurs rarely, and degree 1 never. After having now shortly explained the usefulness and also the weakness of the three reactions:—(a) lymphocytosis, (b) phase 1, (c) W.R. in the blood—there remains still the discussion of the *W.R. in the cerebro-spinal fluid*.

After the W.R. had been discovered in tabes and general paralysis in the blood, Plaut and Wassermann demonstrated it also in the cerebro-spinal fluid. This had a great theoretical significance, for many authors had not yet acknowledged the ætiological connections between syphilis and general paralysis, and between tabes and general paralysis. The first tests induced the opinion that the W.R. in the cerebro-spinal fluid of tabetics is frequent, but it was soon discovered that it is still more frequent in general paralysis, *viz.*, almost 100 per cent. In 1909, at the Annual Congress of the American Medical Association in Atlantic City,

I was able to state that the W.R. in the cerebro-spinal fluid of tabetics is relatively rare, for it occurs perhaps only in 10 to 20 per cent. of the cases. Already, in 1908, Plaut, Stertz, and myself had found that the W.R. in the cerebro-spinal fluid is rare in cases of cerebro-spinal syphilis. Before it was known that this reaction is infrequent in tabetics, the presence or absence of it had been used for differential diagnosis between tabes and spinal syphilis; but this is now no longer possible. These new methods of examination still left undecided those cases in which the clinical symptoms had also failed to assist the differential diagnosis with certainty. I refer to cases of multiple sclerosis, tumour of the brain or of the spinal cord, as against cases of cerebral, spinal, or cerebro-spinal syphilis. I need not point out to my present audience of experienced neurologists how similar those clinical pictures often are, and that the difficulty of differential diagnosis becomes even greater if the individual, in whom one suspects multiple sclerosis, or cerebral or spinal tumour, had passed through a syphilitic infection. In such cases the method of the estimate of the W.R. in the cerebro-spinal fluid was of assistance. This method had first been applied by Hauptmann and Hoessli in Much's Laboratory of the Eppendorf Hospital.

With this method, by the use of larger quantities of cerebro-spinal fluid, it is possible to prove the W.R. in such syphilitic nervous diseases as tabes, and cerebral, spinal, or cerebro-spinal syphilis, while on the other hand cases of multiple sclerosis, cerebral and spinal tumours (extra- and intra-medullary) never show the reaction, even if one increases the quantity of cerebro-spinal fluid from the original 0.2 cc. of Wasserman to 1.0 cc. and more. I have reported from my own practice several examples to show how I succeeded in diagnosing correctly a non-syphilitic spinal disease in a person who had been formerly infected by syphilis, and who suffered from acute spinal paraplegia; the autopsy revealed an intra-medullary soft glioma of the spinal cord, as well as genuine luetic gummata of the lungs. In another case I was able to diagnose in a formerly luetic person, a non-luetic tumour pressing on the optic nerves, and the autopsy revealed a large arterio-sclerotic aneurism of the anterior communicating artery. In a third case with a clinical history of syphilis, I could predict a syphilitic origin of a tumour with localising symptoms in the left frontal lobe, and the autopsy revealed a tough gumma in the left frontal lobe. I mention these three cases from a large number of the same category in order to show that our methods have proved useful in practice. The examination of the cerebro-spinal fluid for W.R., with and without estimation of quantity, should be used especially in cases where it is important to find out whether or not the organic nervous disease is of a syphilitic nature. I deem it useful to sum up, in conclusion, the use of the "four reactions" in tabulated form as follows:—

1. Examination of the Blood.

Wassermann reaction—

- (a) *Positive*:—It is characteristic of syphilis; there are few, if any, exceptions. The reaction is positive also in some cases of recent scarlatina, malaria, leprosy, framboesia, &c.

Positive W.R. of the blood serum means no more than that the person has once been in contact with syphilis (hereditary or acquired), but it does not mean necessarily that the disease in question MUST be luetic.

- (b) *Negative* :—It can be used in differential diagnosis against the existence of general paralysis, for the blood of paralytics reacts, with rare exceptions, positive.

2. Examination of the Cerebro-Spinal Fluid.

- (a) *Normal Fluid* :—Pressure in vertical tube 90 to 130 mm. water; Phase 1 reaction negative; 5 to 6 cells per cmm. at the most (Fuchs-Rosenthal); W.R. negative after the original method (0.2 cc. of fluid), as well as after using larger quantities (0.3 cc. to 1.0 cc. of the fluid).

- (b) *Pathological Fluid* :—

- (1) Increased pressure of escaping fluid (above 150 mm. water).
- (2) Phase 1 reaction positive.
- (3) Lymphocytosis.

These three symptoms (either combined or singly) indicate that there exists an organic disease of the central nervous system (specific or non-specific).

(4) The W.R. of the cerebro-spinal fluid decides whether the disease of the central nervous system is of a luetic nature. If it is already positive by the original method (0.2 cc. a fluid), there is great probability that the case in question is one of general paralysis or tabo-paralysis; less frequently, of cerebro-spinal syphilis; and in exceptional cases, of pure tabes. In the large majority of cases of general paralysis the W.R. is already positive on using only 0.2 cc. of fluid, but in some few cases, and in almost all cases of cerebro-spinal syphilis, and of tabes, the W.R. is positive only on using larger quantities of cerebro-spinal fluid (0.3, 0.4, up to 1.0 cc.).

TYPICAL FINDINGS.

1. General Paralysis or Tabo-Paralysis.

- (1) W.R. in the blood positive in almost 100 per cent. Pressure of cerebro-spinal fluid often increased.
- (2) Phase 1 reaction positive in about 85 to 100 per cent.
- (3) Lymphocytosis in about 95 per cent.
- (4) W.R. in the cerebro-spinal fluid—
 - (a) Positive in 80 to 90 per cent. after the original method (0.2 cc. of fluid).
 - (b) In 100 per cent. by using larger quantities.

2. Tabes (without combination with paralysis).

- (1) W.R. in blood serum positive in about 70 per cent. Pressure of cerebro-spinal fluid often increased.
- (2) Phase I reaction positive in about 95 per cent.
- (3) Lymphocytosis in about 90 per cent.
- (4) W.R. in the cerebro-spinal fluid—
 - (a) after original method (0.2 cc.) positive in 5 to 10 per cent.
 - (b) with larger quantities positive in almost 100 per cent.

3. Cerebro-spinal Syphilis.

- (1) W.R. in blood serum positive in about 80 to 90 per cent. Pressure of cerebro-spinal fluid frequently increased.
- (2) Phase I reaction, only in exceptional cases negative, otherwise positive.
- (3) Lymphocytosis, like phase I, almost exclusively positive.
- (4) W.R. in the cerebro-spinal fluid—
 - (a) with original method (0.2 cc.) positive in about 10 per cent.
 - (b) with larger quantities of fluid almost always positive (of special value for the differential diagnosis as against multiple sclerosis).

A closer study of this tabulated summary shows that the use of even all four reactions does not yet solve all the questions as to diagnosis of the diseases of the central nervous system. It is even possible that the result of the serological, cytological, and chemical examination of blood and cerebro-spinal fluid may be misleading. For instance, it happens in some few cases that the blood of a general paralytic shows negative W.R., and that in a pronounced tabetic all four reactions are negative; this seems most likely to occur in chronic old standing cases, and in hereditary tabes. While it has never occurred in the Nonne ward that the W.R. in the cerebro-spinal fluid of a paralytic was negative by using larger quantities of fluid; cases of cerebro-spinal syphilitic arteritis have repeatedly shown a total absence of fixing elements in the cerebro-spinal fluid. I need not discuss again the possibility of a combination of a non-specific disease of the central nervous system with a specific one, whether stated in the history or not. Owing to the stated sources of error, of which there still exist many, it follows that even if one uses all four reactions, one has still to use the greatest critical caution in diagnosis. If the observer does not wish to run the risk of grave diagnostic errors he has still to apply a careful and detailed clinical examination in each individual case, working hand in hand with the more modern methods. Some sceptics and critics have already sarcastically remarked that the pivot of medical examination lies, now-a-days, in the Laboratory; but this is by no means correct. On the other hand, we may say, after some years of careful and conscientious testing of the modern methods of examination, that by their complete mastery and their logical and critical application, we have obtained an excellent aid towards the diagnosis of the affections of the central nervous system, especially of the syphilitic ones.

THE EFFECT OF SALVARSAN ON SYPHILITIC NERVOUS DISEASE.

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IN considering this question, it is advisable to first of all take into consideration the theoretical possibilities. It is well known that nervous tissue, at any rate in adult life, never reproduces its like, and that once neurones are destroyed, this loss is permanent. There is another factor, however, to be taken into consideration when considering the functioning of the nervous system as a whole, and that is, that other portions of this system appear to be able to take up, more or less efficiently, the functions of the parts destroyed.

The experience of the past has allowed us to divide the nervous diseases due to syphilis into two classes. Into the one class are placed those diseases of the system which have shown themselves to be directly amenable to ordinary specific treatment, the forms, that is, that occur during the active stages of the syphilitic disease; into the other class are placed certain nervous affections which are not, or, at any rate only to be a very slight extent, amenable to specific treatment, even when this treatment is carried out in its most intense form. These are the affections which appear to occur after the subsidence of the active stages of the syphilitic disease, and are the affections which are generally known as parasyphilitic.

There can be little doubt that the toxin producing the one class of affection is different to that producing the second.

During the active stages of the disease the affections manifest themselves as definite localised conditions, though at times these conditions becomes more general. An example of this is ophthalmoplegia, which, though it usually occurs as a more or less isolated phenomenon, may be accompanied by affections of the higher neurones, as disclosed by a condition of general mental irritability. The most direct examples of the second class of cases are locomotor ataxia, and the general paralysis of the insane. Syphilis, therefore, during its active stages may be said to produce functional disturbance, which is distinctly recoverable, even at times without treatment, and which in only a minority of cases goes on to organic destruction; it is noteworthy too, that even where some neurones have been destroyed, the extension of this destructive process to others, can be completely arrested. In the parasyphilitic manifestations, there is, we believe, a definite organic destruction of neurones, marching *pari passu* with the earliest clinical manifestations of disordered functions. It may be said that the cortex of the mildest case of general paralysis shows definite irreparable lesions, and though exceptionally the disease process seems to be temporarily arrested, yet the rule is that once commenced, this destructive process goes on involving greater and greater numbers of the highest neurones. With our most efficient treatment we have hitherto been completely unable to arrest this destructive process, for where arrest has at times taken place, it appears to have taken place irrespective of treatment. In observing the action of salvarsan as a therapeutic agent against syphilitic disease of the nervous system, we must bear in mind these two classes of cases. Speaking generally, the one class has always been amenable to treatment,

and the question to be asked, therefore, resolves itself into the query, is salvarsan more efficient than other means at our disposal in dealing with these cases? For the second class of case, we have hitherto had no therapeutic means of any value whatever, and the question, therefore, in this connection is, does salvarsan produce any improvement, and what is the degree of improvement?

In the class of disease associated with the active stage of syphilis, we should get a complete and permanent cure, for that we have been able to obtain with mercury and the iodides. Do we with salvarsan, obtain this curative effect more completely and more rapidly than we can by using the older therapeutic measures? In the second class of case, the question unfortunately is an entirely different one, because at the time when the disease first becomes manifest to the patient or to his physician, there has already taken place definite neuronie destruction, a destruction which we know to be gradually progressive. No therapy can ever replace the destroyed neurones. Can the means be found to arrest the destructive process and have we this means already at our disposal in the shape of salvarsan? If it could be made clear that the disease of general paralysis for example, could be arrested, the fact would be of the greatest importance, for, with close clinical observation, the disease might be diagnosed and arrested at a date when only very few neurones had been destroyed—at a date in fact when a return to the patient's characteristic individualism was still possible. Is there any evidence of such arrest after the use of salvarsan?

In considering the salvarsan treatment of syphilitic nervous disease we have not only to investigate its action on the pathological condition, but we must also observe whether or not it has any deleterious effect on the whole or any part of the nervous system. As a fact there exists some evidence that salvarsan has a rather special action on this system. Battmann (1) has described a case of herpes occurring after its injection. Stern (2) has described three cases of external ophthalmoplegia, occurring after intramuscular injection of the drug, and ascribable in his opinion to it. V. Bokay (3) has described good results from the use of the drug in chorea. Several cases of nearly complete deafness have occurred after the injection of the drug, three such cases having occurred in the writer's own experience. Whether these nerve lesions are due to the drug or merely syphilitic manifestations is still a little doubtful, though evidence is accumulating that they are essentially syphilitic in character. Ehrlich (4) in his address at Frankfort last year, spoke of the cases of deafness as being due, in his opinion, to the infecting organism, and not to the drug. Davids (5) believes ophthalmoplegia and certain other nervous phenomena occurring after salvarsan to be syphilitic, basing his opinion on the very good ground that they disappeared after a second administration of the drug. Of the three cases of deafness occurring in the writer's experience only two have remained under observation. In all three the deafness came on with great suddenness in a week to a fortnight after the last injection, and the deafness was extraordinarily complete. One of the cases that have remained under observation has been greatly improved by a further injection and by the administration of mercury and iodides. The second case has been completely cured by two more injections. One case in the writer's experience is somewhat unique from the point of view of the drug's action on the central nervous

system. P.H., æt. 30, was sent to me suffering from advancing optic atrophy of syphilitic origin. He was a spare man with an active temperament, in good health, and with a cheerful disposition. On 4th May, 1911, he was given .5 grammes salvarsan intravenously. 5th May, 1911, he felt fairly well. 6th May, 1911, he went to work and took things quietly, feeling fairly well. 7th May, 1911, he had a hard run for his morning train. In the train his friends remarked that he looked ill. When he arrived at the warehouse, small sounds caused him great pain and seemed like shells bursting in his head. He became very nervous, and after lying down, was sent home in charge of a friend. On leaving the tram he ran away under the impression that some horses, drawing a waggon some fifty yards away, were trampling on his heels. For the next two days the patient was partially delirious. He made mistakes of identity and spoke in a rambling manner. His general condition remained good, and in a few days these symptoms gradually subsided, and the patient regained his usual health. This case is of special interest because these mental phenomena did not appear until the third day after injection. A further injection of .35 grammes intravenously three weeks later was quite uneventful.

In regard to the production of optic neuritis, an event which was at one time so much apprehended, it must be fairly admitted that no such danger exists.

Of all the alleged and proved direct effects of the drug on the different parts of the nervous system, the great and consoling fact appears to stand out that no direct permanent damage to the nervous system results from its use.

Although no great period of time has elapsed since the introduction of salvarsan, yet it has been used to such a large extent, that we are already able to form some fairly complete idea of the value of this drug in the various manifestations of active syphilitic disease of the central nervous system.

It will be of interest to recall some of the more striking cases and definite opinions from the literature. A. Neisser (6) has described a case which, six months after infection, developed cerebral syphilis with optic neuritis, choked disc, ocular muscle paralysis, and intense headache. Mercury and potassium iodide were tried without effect, but the latter combined with an injection of .3 grammes of salvarsan effected a complete cure. Treupel (7), in 1910, described a case of double ptosis epileptiform convulsions, and paresis of the left arm which was cured by the drug. In 1911, the same writer (7a) described cures after treatment by salvarsan as resulting in a case of external ophthalmoplegia with paresis of left leg, a case of hemiparesis and choked disc, another case of left-sided ophthalmoplegia, and he mentions a case of fits occurring in a syphilitic patient, who, after salvarsan treatment had no further attacks. He states that in early cases of cerebral syphilitic paralysis, the troubles of mentation, early optic neuritis, and headache disappear in a few days. He considers that cerebral gummata disappear more rapidly and completely under salvarsan than when treated with mercury and potassium iodide. V. Grosz (8) expresses the opinion that salvarsan is extraordinarily effective against syphilitic eye troubles, as for example, chorio-retinitis; and Wechselmann (9) considers its action against all syphilitic brain processes as particularly quick and effective.

Falta (11) on the other hand believes that salvarsan does but little good in syphilitic optic neuritis, regarding mercury and potassium iodide as giving excellent results, unless salvarsan has been previously used, for after its injection, the value of these two drugs is greatly diminished.

Our own experience of its therapeutic value in nervous affections is distinctly favourable, as the following cases show :—

B.P., æt 16; admitted into Royal Prince Alfred Hospital, Sydney, 18th February, 1911. *History*.—Father and mother living; five brothers and sisters dead in infancy. Patient was well till two years ago, when he had what was termed a sunstroke, and has since been going blind, and has had a persistent severe headache. A week prior to admission he lost the use of his right arm, became unconscious, and could not speak. This attack was ushered in by a period of great emotion. On admission he was found to be very lachrymose, and was deaf, dumb, and blind. There was flaccid paralysis of the right arm, and the right leg was partly paralysed. There was some twitching of the left side of the face and the left leg. There was conjugate deviation of the eyes to the right, and the pupils were unequal. The patient was very irritable, and there appeared to be a condition of hyperalgesia on the left side. There was tenderness over the left side of the head on percussion. He exhibited rectal and vesical incontinence. Hutchinson's teeth were present. The Wassermann reaction was strongly positive. On the 22nd March, 1911, the patient was given .3 grammes salvarsan. For some days food had to be given by a nasal tube. On the 27th March, 1911, he was somewhat brighter. 4th April, 1911, .35 grammes salvarsan was given; on the 4th April, 1911, there was definite improvement in the patient's mental condition, and the paralyzes were less marked. 14th April, 1911, the patient had considerably improved, and for the next six weeks his improvement continued uninterruptedly. He was then discharged, there being no paralysis and no twitching; the incontinence had quite disappeared, and the patient looked well and healthy. He was able to converse rationally, but did not exhibit a high order of intelligence. He has not since been seen.

L.H. æt 21; infected four years ago. Treated with Hg. and KI. intermittently ever since. She came to the Out-patients' Department of Royal Prince Alfred Hospital in March of this year with troubles of locomotion, and showing a papular rash on both legs. She was admitted 3rd April, 1911. On examination there was found to be a spastic condition of both legs, together with considerable paresis. The patient was able to shuffle along, but with great difficulty. There was marked incontinence of urine and fæces. The knee jerks were greatly exaggerated. 4th April, 1911, the patient was given .3 grammes salvarsan. On 7th April, 1911, she already showed slight improvement as regards the incontinence. She was discharged in the following week, and has attended the out-patient department ever since. She is being given mercury and iodide, and the improvement at present—9th October, 1911—is extremely marked. She walks perfectly freely, has regained control of the bladder and rectum, and looks well and healthy. This patient had, prior to the injection of the salvarsan, not been progressing on mercury and iodide, but since the administration of .3 grammes of the former intravenously, the improvement has been very striking, and must, I think, be attributed to the combination of the three drugs.

M.M., female, æt 30; married. Infected by husband one year ago. Has had definite secondary rash and gave a positive Wassermann reaction. For the past three months she has had an intense, and at times, agonising headache.

Her condition—16th August, 1911—revealed nothing except the intense headache, and slight optic neuritis in the left eye, with failing sight. Patient was greatly depressed.

1st October, 1911.—.4 grammes salvarsan injected intravenously.

8th October, 1911.—Her condition was greatly improved. The depression was less marked, and the headache had almost disappeared; .4 grammes salvarsan again injected.

10th October, 1911.—Headache disappeared and patient greatly improved.

Another case of marked cephalalgia was the following :—

L.A.J., æt 60.—This patient was infected twenty years previously, and has well-marked specific scars on the legs. For the past twelve months she has been afflicted with intolerable headaches, which she said were so severe as to cause her to consider suicide. During this time she was treated with almost every known drug likely to affect the condition, including mercury and iodide; but no effect was produced. 18th March, 1911, .35 grammes salvarsan was injected intravenously with no immediate improvement. 11th April, 1911, the headache was said to be worse. 16th May, 1911, she developed abdominal pain and tenderness, and became jaundiced. On 11th May, 1911, cholecystotomy was performed. A condition of chronic inflammation of the gall bladder was found. The wound closed up on 29th May, 1911. One week after the operation the headache had entirely disappeared, and the patient seemed quite well. She was discharged a few weeks later.

This case is of interest because of the apparent failure of salvarsan. But probably the lesson to be drawn from it is that not all symptoms occurring in a syphilitic patient are necessarily syphilitic.

The effect of salvarsan on syphilitic eye affections is one of very great importance. Falta (11) regards salvarsan as of little use in optic neuritis, whereas Von Grosz (8) believes it to be extraordinarily efficacious against all specific eye affections, including chorio-retinitis.

The writer's experience in optical conditions has been a varied one. The first case of this kind I saw had one of the most striking results that I have seen or read of. The patient was under the care of Dr. McMurray, and Dr. F. A. Pockley was the consulting oculist. It was a case of irido-cyclitis and acute glaucoma, occurring in an elderly man. Dr. Pockley described the case in these terms the day after the injection of .6 grammes salvarsan :—

“I saw the case on Saturday when he was unable to distinguish the furniture in my room. On Sunday he was given an injection, and this afternoon, when I came out to see him, to my amusement, when I entered the room, he was reading the newspaper.” Some months have now elapsed and he has remained permanently cured. This, however, is one of the cases in which nerve deafness has supervened, and the one in which recovery from this condition is taking place.

The second case was one of almost complete blindness of the left eye due to optic neuritis. Marked changes in the vitreous developed. He was given an intramuscular injection of .6 grammes of salvarsan with some temporary improvement. He continued taking mercury but showed a marked idiosyncrasy against potassium iodide. About two months after the first injection he was given .4 grammes salvarsan intravenously, the sight at this time being greatly affected. This injection caused considerable pain in the eye. He has been kept on large doses of mercury ever since the last injection of salvarsan, and at present his sight is approaching normal. It is impossible to say which drug has had the most marked effect. I have three other cases in later stages of the condition, and no marked result has followed the use of the drug. My opinion, and I think that of the ophthalmic surgeons with whom I have worked, is that in very acute conditions salvarsan may, if used at once, save the irreparable complications, but that where matters are subacute or chronic, no more is to be effected by its use than was to be obtained by the older therapeutic methods.

We now come to the consideration of the effect of this drug on the so-called parasyphilitic nervous affections :—

In this field also Treupel (10) appears to have had a very considerable experience. Unfortunately, although he is extremely favourably impressed by the drug even in these conditions, he records the fact that he has never seen undoubted improvement, he has only seen arrest of the process.

Of twenty-two cases of tabes injected the majority showed improvement, which in some cases was very marked. Of twenty-two cases of general paralysis of the insane he saw improvement in only seven, the remaining cases being unaffected. He is of the opinion that it is absolutely the correct treatment in both these conditions, as it abolishes lightning pains, the ataxia improves, the paræsthesias become less marked, and the patients feel stronger and more comfortable. These improvements, however, at times regress to appear after a further injection which the patients often ask for. He mentions that death occurred in one case two days after .4 grammes intravenously. Post-mortem the patient was found to have died from pachymeningitis hæmorrhagica, which had of course been slowly developing for a long period.

Neisser and Kuznitzky (12) agree that salvarsan should be administered in cases of early tabes, but in 1910, they qualified this opinion by adding "if no optic neuritis be present." It is very doubtful in my opinion if they now believe in any such limitation. Joannides (13) has seen the disappearance of lightning pains and the improvement of the gait in tabes.

Concerning this second class of nervous disease induced by syphilis, I have only four or possibly five cases to record, in which I deemed it reasonable to use the drug. Two were cases of tabes and two cases of general paralysis. One case of general paralysis had suffered from nervous symptoms for about three years. He had grandiose ideas, but was only to a slight extent demented. Two injections of .5 grammes given at an interval of three weeks produced only some very slight improvement in the patient's mental condition. The disease was not arrested and he died from some intercurrent trouble some two or three months later. The second case had given evidence of mental affection during the past six months. He was given two doses at a week's interval of .4 grammes intravenously. Two months after the last injection his friends wrote that there was a very great improvement, and that they were thinking of trying to obtain some office work for him. He has, however, got steadily worse since then, and is now becoming demented. Both cases of tabes have improved to a considerable extent. The first case had noticed the symptoms for a few months and was given .4 grammes intravenously. The second was given two doses of .4 grammes at one week's interval. After the second injection a large varicose vein in his right thigh clotted. The clot only affected a superficial bunch of veins, which have now become fibrous. The patient and his friends regard the result so far as concerns his powers of locomotion and general condition as extremely satisfactory. I think the improvement has been very marked. A third case was one of doubtful early tabes with some slight inco-ordination, ptosis, and slight internal strabismus of the right eye. After

two injections of .4 grammes intravenously at a week's interval, the symptoms began to gradually clear up, and when last seen the improvement was very distinct.

From the above records it will be seen that the evidence definitely favours the use of the drug in tabes, but that less reason exists for giving us hope in regard to general paralysis.

Looking at the position in the light of the experience of ourselves and others, we think that the following conclusions indicate the truth, so far as it has yet been determined, in regard to the treatment of syphilitic nervous diseases by salvarsan.

In early conditions of syphilis of the nervous system affecting either the brain, spinal cord, or cranial nerves, salvarsan must be regarded as having a rapid and satisfactory effect. It has the advantage over the older methods in that it produces its effects more quickly. It seems impossible as yet to say whether the results will be more lasting. It can, however, be assumed on theoretical grounds that the benefit produced by this drug cannot be less permanent than the benefit produced by mercury and the iodides. As regards eye affections involving nervous structures, no definite conclusion can be arrived at, since we find in the literature absolutely conflicting views in regard to its efficacy, the balance of evidence, however, being distinctly favourable. In the parasyphilitic affections it can be said to have a distinctly beneficial but not lasting effect, though some cases of tabes appear to have been permanently improved, especially as regards the more distressing symptoms.

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ON THE USE OF SALVARSAN IN CERTAIN MENTAL DISEASES WITH A POSITIVE WASSERMANN SERUM REACTION.

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IN the etiology of insanity, syphilis has been proved to be a factor of very great importance, and we have every reason to believe that in general paralysis of the insane it is of primary importance.

From our knowledge of the many and various lesions of the nervous system caused by syphilis, we may expect to find that many cases of mental disorder, manifested in different forms, may be due to localised syphilitic lesions such as arteritis, gummata, and meningeal inflammations which may give rise to no evident disturbance except in the mental faculties. In the Wassermann reaction we have a valuable and, in most cases, a very reliable means of ascertaining the presence of the syphilitic poison, or of the alterations in the bodily metabolism which may have been set in motion at some previous period by the ravages of the *spirochætæ pallida*. We do not exactly know the reason why a positive Wassermann is obtained in the blood of many cases a number of years after the ordinary manifestations of syphilis have disappeared, and cases have been known in which the Wassermann was found positive, yet none of the ordinary clinical signs of syphilis had ever occurred. It may be according to the theory that profound metabolic changes have been set up which remain persistent long after any syphilitic poison has gone. On the other hand it may be that there remains for years afterwards some latent focus of infection, perhaps some encysted and well protected nest of *spirochætæ* in the liver, spleen, or other organs, or in the vessel walls. These, like a focus of tubercle bacilli in the lungs, lie dormant and spring into activity under conditions of weakened bodily resistance. In support of this latter theory certain authors state that *spirochætæ* have been found in the vessel walls in old standing cases of syphilitic arteritis and in old healed lesions.

One of us (H.H.J.) has had a Wassermann reaction determined in the blood of all the cases admitted at the Hospital for Insane, Callan Park, during the last fourteen months, and finds that of 452 cases of recent insanity 65 gave a positive reaction. Of these cases, the mental manifestations are as follows :—

							M.	F.
General paralysis	...	...	...	...	...	...	15	1
Organic dementia	...	...	...	...	...	...	4	2
Mania, Recent	...	...	...	...	...	...	6	5
Mania, Chronic	...	...	...	...	...	...	5	4
Melancholia, Recent	...	...	...	...	...	...	4	3
Melancholia, Chronic	...	...	...	...	...	...	1	1
Confusional insanity	...	...	...	...	...	...	1	...
Delusional insanity (non-systematised)	...	...	...	...	...	...	3	5
Epilepsy	...	...	...	...	...	...	1	1
Insanity, with grosser lesions of brain	...	...	...	...	...	...	...	1
Congenital mental deficiency without epilepsy	...	...	...	...	...	...	1	...
Dementia Senile	...	...	...	...	...	...	...	1
							—	—
Total	...	...	...	...	...	...	41	24

Of clinical G.P's. giving a positive Wassermann, 15.

Of clinical G.P's. giving a negative Wassermann, 7.

At the Hospital for Insane, Gladesville, in a number of newly admitted cases of recent insanity, the Wassermann reaction has also been determined, and several cases which are not general paralytics have given a positive Wassermann.

Flashman and Butler state that "the almost uniformly positive nature of the reaction in general paralysis must be dependent as a diagnostic agent on the negative results of the test in cases of mental diseases other than general paralysis." From the table of cases given above, it is evident that a positive reaction occurs in many other mental diseases besides general paralysis.

Whether it is that the altered condition of the blood which is capable of giving a positive reaction may act as a cortical irritant and give rise to mental disturbance, or not, we do not know, but it may be that the positive Wassermann indicates some obscure old-standing cerebral lesion causing loss of mental equilibrium. However, the positive reaction may merely indicate the existence of former syphilitic infection which may have no direct relation to the patient's insanity; for example, in acutely maniacal and melancholic cases, the exciting cause being alcohol, several have given a positive Wassermann, and without antisymphilitic treatment, have shortly regained their former mental health.

In these cases we cannot conclude that the positive reaction has any relation to the mental breakdown, except that it may indicate former syphilitic infection, and a nervous system weakened and of low resistance to the effects of alcoholic poisoning.

Our investigations, of which we are giving a preliminary report, are for the purpose of ascertaining if treatment with salvarsan has any beneficial effect on the mental states of typical cases of different forms of mental diseases, all of which, previous to the administration of the drug, have given a positive Wassermann reaction. With one exception we have rejected cases with syphilitic lesions of evidently recent origin.

So far we have treated 14 cases, including the following types:—Early general paralysis—3 men, 1 woman; advanced general paralysis, 4 men; tabo-paretics, 2 men; delusional insanity, 2 men; recent melancholia, 1 woman; chronic mania, 1 woman.

In all cases we have used the intravenous method, and if the patient appeared to be in sufficiently good physical health, we have given .6 gramme of salvarsan for each dose, and repeated this after about seven days' interval. We have examined the physical and mental condition as well as the clinical examination of the blood and urine before and after the exhibition of the salvarsan. The Wassermann reaction of the blood has also been determined at frequent intervals.

The following is a general summary of the cases treated, and at the end of the paper we give a more detailed account of each individual case.

A.—MENTAL SYMPTOMS.

(1) EARLY GENERAL PARALYSIS, FOUR CASES.

These cases were sufficiently well-marked cases of early general paralysis. They had all shown signs of change of disposition, reflexes were plus, speech slightly affected, and with other early signs. After the first dose of salvarsan there was in one case marked excitement, which subsided after the first day, the substance seeming to act as an irritant to the brain. In the others there was very little change. In three cases there was slight general improvement in a few days, but in the fourth there was slight mental and physical deterioration. As yet, two of these cases have not been treated to more than one injection. In the two who received a second injection, acute exacerbation of the mental symptoms quickly followed the second dose; one becoming extremely violent, and the other from a quiet type of early general paralysis, becoming a noisy, restless, and troublesome individual, offering millions of money to all around, as if advanced stage of the disease had been precipitated.

(2) ADVANCED GENERAL PARALYSIS, FOUR CASES.

All typical cases, with all the typical physical and mental signs of advanced general paralysis, history of syphilis obtained in one case. Since admission three had had a number of epileptiform attacks, and all had marked exaggeration of deep reflexes and pupil changes, and were very delusional. After the first injection, two cases showed great excitement for twenty-four hours, singing and noisy, and habits worse; the other two showed no mental perturbation. After the second injection, one case who was much excited after the first again showed similar excitement. Three of the cases have had epileptiform fits occasionally since from about a fortnight after the second injection. Three of them have showed no mental improvement, and in the fourth there is evidence of marked mental and physical deterioration.

(3) TABO-PARETICS, TWO CASES.

Were both delusional cases, with speech affected and absence of knee-jerks, fixed pupils, and other characteristic signs, one of them had optic atrophy in one eye. After the first injection, one showed mild excitement which continued for over three days, during which time he showed great increase of general tremor and further impairment of speech. In six days after injection he took a severe succession of fits. He slowly recovered to a certain extent, and though having no further fits, has since become more demented. In the other case there has been very little change after both injections except that he has become more demented.

(4) DELUSIONAL INSANITY (NON-SYSTEMATISED), TWO CASES.

Both these cases showed mental symptoms in some respects resembling general paralysis, but the physical signs were not in accordance with that disease. One had a condition of chorea involving the facial muscles and neck muscles and had marked delusions of persecution and hallucinations

of smell. The other had slightly exalted ideas of the type of a chronic delusional case. After the first injection there was distinct improvement in the general physical and mental state of both cases; and after the second, no change in one and in the other further improvement. This latter case had previously shown improvement in the chorea condition after treatment with potassium iodide, but which had been left off some time previous to the administration of the salvarsan.

(5) MELANCHOLIA (RECENT), ONE CASE.

Received two injections; slight mental improvement after first, marked mental and physical deterioration after second.

(6) CHRONIC MANIA, ONE CASE.

Of five years' standing (poorly nourished and with erosion of palate and ulcer of wrist). After dose of .6 gramme her condition, which previously was one of considerable mental excitement, changed at once into a state of mental quietude. This improvement persisted for a week, but unfortunately, owing to gangrene supervening on the wrist condition, she succumbed after operation.

Marinesco makes reference to exacerbation of mental symptoms after salvarsan, and on another occasion reports that in six cases of general paralysis, the results were practically nil. C. Treupel states distinct transitory improvement in the mental symptoms of a case of incipient general paralysis, and in a later communication states that in nineteen cases of tabes and progressive paralysis the patients improved after the injection, and in general paralysis a better mental level was reached. Hügel and Reute observe that in one case of commencing mental paralysis no change occurred. Pick, of Vienna, is not convinced of any improvement in G.P's. Faveuld, of Trieste, is of the same opinion. Robertson mentions that one of the best apparent recoveries of a case of undoubted general paralysis occurred after the use of salvarsan, although in most cases there was no apparent benefit. Ehrlich and McDonach give a short account of recovery of a case of early general paralysis, but state that when dementia has once set in an injection is not only valueless but dangerous.

Gifford and Harrison report marked improvement in speech in early general paralysis after two intravenous injections of .2 and .4 grammes, given at intervals of two weeks. J. H. Liceard and M. Bloch conclude that it is useless in general paralysis, even when employed at the onset of the first clinical symptoms. Marcus states, after observation of fifty patients treated with "606," that it cannot cure advanced cases of general paralysis, yet holds that their condition can be improved. Finckh suggests the use of salvarsan without hesitation in all early manifestations of general paralysis as long as the disease is still actively progressing, and he adds that reinjections are absolutely necessary.

With regard to its use in other forms of mental disease we have as yet found no reference.

B.—PHYSICAL CONDITIONS.

EFFECT ON GENERAL HEALTH.

With the exception of one, loss of weight has occurred in all the cases, the greatest being in the case of melancholia. The patient who gained in weight was the delusional case with chorea. One observer states that in twenty-three cases the general weight of the patients increased after injection.

One patient complained that he felt a throbbing in his head during the injection. Two cases stated they felt a peculiar taste in their mouth also during the injection. Vomiting occurred in most of the cases, also diarrhoea in several. Rigors accompanied by rise of temperature were noted in most cases except one general paralysis and the case of chronic mania—this occurred from within two to four hours after injection—the highest temperature being 103·8 in one case of early general paralysis after .4 gramme, but the patient suffered from mitral heart disease. The pulse increased correspondingly to the temperature in all cases.

The blood pressure varied very considerably. In the early cases of general paralysis there was slight lowering of the blood pressure from two to four hours after injection. In the advanced G.P's., with the exception of one case, all had rises of pressure within two to four hours, and in one case it had risen by 25 mm. in twenty-four hours.

Duhore, quoted by Emery, states that such symptoms as diarrhoea, violent febrile reaction, and dryness of throat, are normal complications following a large intravenous injection, and attributes them to arsenical intoxication.

BLOOD CHANGES—WASSERMANN REACTIONS.

The following are the results tabulated :—

Case.	Re-action.	Type of case.	First In-jection.	Re-action after 1 week.	Second In-jection.	Re-action after 2 weeks.	Re-action after 3 weeks.	Re-action after 4 weeks.	Re-action after 5 weeks.
E.D.	Pos.	Tabo-paretic ...	·6	Pos.	...	Pos.	Neg.	Neg.	...
H.K.	"	" ...	·6	"	·6	Neg.	...	...	...
M.H.	"	Early G.P. ...	·4	"	...	...	...	...	...
J.J.	"	" " ...	·6	"	·6	...	Pos.	...	...
W.C.	"	" " ...	·5	"	·6	...	"	...	...
W.D.	"	" " ...	·6	...	...	...	...	...	...
J.M.	"	Adv. " ...	·6	Neg.	·6	Neg.	...	...	...
A.P.	"	" " ...	·6	Pos.	·6	...	Pos.	...	...
E.P.	"	" " ...	·6	"	·6	Pos.	...	Neg.	...
W.T.	Part Pos.	" " ...	·6	Neg.	...	...	...	...	...
C.B.	Pos.	Chr. mania ...	·6	Died	...	...	...	...	...
M.D.	"	Mel., recent ...	·4	...	·5	Part Pos.	...	...	...
W.M.	"	Del. ins. ...	·2	...	·6	...	...	...	...
W.D.	"	" ...	·4	Pos.	·5	Pos.	...	Pos.	...

These Wassermann determinations are insufficient to make any definite statement, but in six cases the reaction was altered by the injections within four weeks.

Hæmoglobin Content.—No alteration which could be attributed to the salvarsan was found.

Red Cells.—In the advanced G.P's. there was some decrease in the red blood cells some days after the injections, and in early G.P's. there was a slight increase, which condition coincided practically with their general condition of health at these times.

In the other cases no changes were found.

White Cells.—No permanent increase of the leucocytes was observed, and in no instance of eosinophilia.

J. R. McDonach states that in every case there is a leucocytosis, generally about 17,000, and may be as much as 30,000, chiefly neutrophil leucocytes; occasionally eosinophilia is found.

The Urine.—In one case there was a trace of albumen in the first urine passed after the injection of .5 gramme, but none was found in later specimens. In no instance was there any sugar. Retention of urine occurred in an advanced G.P. two days after the injection, but as this occurs frequently in G.P's., it was not necessarily attributable to the salvarsan. One patient had chronic renal disease, but did not suffer after moderate doses of the drug. The quantitative examination of the urine before and within twenty-four hours after the injection showed in some instances increase of the chlorides, phosphates, and purin nitrogen.

The reflexes showed no changes, and there was no sign of optic mischief following the use of the salvarsan.

Some time after the injections two of the cases of early general paralysis have been put on a course of potassium iodide. If the salvarsan had destroyed any latent (?) spirochætæ, then the potassium iodide should tend to cause removal of any chronic changes in the tissues of the brain which may have been due to the syphilitic poison.

The number of cases which we have so far treated are insufficient to allow of any definite conclusions. In the early cases of general paralysis, the slight improvement noted after the first injection may have been due to improved state of bodily health which follows in many cases the administration of salvarsan. Evidently a second dose, if repeated so soon as a week's interval, does harm.

In advanced G.P's., benefit could scarcely be expected, and in our cases it did more harm than good. It is possible that in some cases salvarsan may arrest the degenerative processes and the disease may remain stationary. This, however, can only be determined after the usual duration of the disease has elapsed.

TWO UNUSUAL CASES OF CEREBRAL HÆMORRHAGE.

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I AM encouraged to bring before you these few notes on two cases of cerebral hæmorrhage, partly because the section of medicine has taken the subject of arterio-sclerosis for its special theme, and partly because the post mortem in these two cases cleared up two puzzling cases of insanity, both of which, while adding to the number of certified insane in this country, hardly deserved to, I think. Their histories, if incomplete, are interesting, having so much in common.

Patient A., male, æt. 31, is said to have had fits while teething. At 12 years was struck by a stone and knocked down, but did not lose consciousness; shortly after, however, his right arm became paralysed, and his right leg stiff. At 19 he took fits, apparently mild in nature, but afterwards violent. He could at times do ordinary light jobs, but could never be really trusted. For the last five years his gait has been noted as staggering. Sometimes he would have forty light fits in a day, sometimes escape them for several days at a time. He was certified insane because of his fits, for refusing food, using obscene language, and crying out loudly. Admitted 19th November, 1910, into a Hospital for Insane, when his condition was one of profound collapse, conscious, but speechless. He died twelve hours afterwards in an epileptiform attack. Post mortem, done that day, showed a large old hæmorrhagic area, involving the right internal capsule, external capsule, and adjoining nuclei up to the island of Reil, altogether $1\frac{3}{4}$ inch. Part of this area was quite calcified; indeed, only microscopic examination showed many recent hæmorrhages. Now this is the place of election of cerebral hæmorrhage, but there were also numerous hæmorrhages, from a pea in size down to capillary conditions in the cerebellum, a condition which obtains in less than 1 per cent. all intra (brain) cranial hæmorrhages.

The second case gave this history:—He was aged 31. Parents say he was quite well until a few days ago, when he suddenly took some fits. He was admitted into a General Hospital, whose report says:—"He takes no notice, his attention cannot be attracted, faulty in habits." After remaining there a day was sent into the Reception House. The fits were diagnosed as epileptic, and the condition one of cerebral syphilis. In the Reception House he refused food, was violent at times, using vile language, was faulty in habits, vomited. Besides a superficial bruise over left eye, there was nothing special noted in his physical condition there. He remained in this condition helpless in bed for seven days, after being sent to the Hospital for the Insane, when he suddenly died. The first twenty-four hours in the mental hospital he was comatose, but afterwards answered in a few short words how he felt. Temperature sub-normal, pulse 85. Urine showed trace albumen, otherwise normal. Post mortem: Skull and membranes normal, a small area

($\frac{1}{2}$ inch) of fairly recent hæmorrhagic softening noted at the extreme tip of each of the occipital lobes. Rest of brain apparently normal. Both lungs engorged, lower left lobe consolidated (hypostatic pneumonia). Heart enlarged and left ventricle much hypertrophied, no valvular lesion nor apparent affection of the remaining vascular system noticed. Both kidneys very small, in an advanced condition of chronic nephritis, each weighing a trifle over 2 oz. Remaining organs normal. Urine withdrawn post mortem; contained large quantities of albumen, but no sugar. Cerebro-spinal fluid a few hours after death gave a negative Wassermann."

In contrast to these two young adults might be mentioned a male patient of some 60 years, an inmate of twenty-five years' standing. The only physical signs noticed in him during these years being a hard, full pulse, not easily compressible, a slight tremor of the upper lip, and a certain immobility of the facial expression. He had very good preservation of his mental faculties, his failing being some obscure delusions at times, with a sexual colouring and persecution, and a faculty of exaggerating stories about people, and determined idleness. He suddenly had a succession of obscure seizures, became confused, ran a temperature, rapidly became emaciated, with wasting of the limb muscles; afterwards improved, and his mental state was quite reversed, worked hard, spent hours on his knees praying, and accused himself of all he had accused others. In a year the condition recurred, ending in death. A careful post mortem showed no obvious naked-eye manifestations of disease, no sign of cerebral hæmorrhage. Microscopically, there were seen a mild degree of hyaline degeneration in the small vessel of the brain and cord, and some cortical neuroglial proliferation. The nervous tissue was well fixed, and Weigert's method showed no tract degeneration. Yet in the cord, in the cervical and lumbar, but not dorsal region, were hundreds of capillary hæmorrhages, and also quite a number of anterior cornual cells, showing not only marked chromatolysis, but even with just the bare outline visible, while the majority stained perfectly by Nissl's method.

Case 1 microscopically showed near the areas of hæmorrhage the most advanced condition of hyaline degeneration I have experienced. Numbers together of the arterioles and venules had their coats completely transferred into homogeneous material exhibiting no cellular, and at times no fibrous structure at all. Sometimes mere hyaline rods were all that remained of once functioning vessels. In others a few cells were left of the lining endothelium, while every section showed, often in proximity to these obliterated vessels, new capillaries with exceedingly delicate walls, engorged with blood so that they were larger than the original vessels they replaced. Many had ruptured, and while many hæmatoidin granules abounded there were many microscopic recent hæmorrhages. Nerve cells had disappeared, and neuroglia proliferation had taken place. In the cerebellum, besides this were seen innumerable pale yellow (not brown hæmatoiden) pigment granules,

peculiarly arranged in great numbers around and in the cells lying around the purkinje layer. These pigment bodies lie almost exclusively in the neighbourhood of the cortex cerebelli, not in the white matter nor pia arachnoid. The pia was thickened, showed cellular proliferation, and much intra-pial minute hæmorrhages. The short blood-vessels of the first layer of the cortex also showed a lesser degree of fibro-hyaline degeneration.

Case 2 was an example of quite the earlier vascular changes in the brain. Here, near all the hæmorrhagic areas, the smaller blood-vessels showed considerable proliferation of the lining endothelium, causing the vessels to appear much thicker, but as yet only a cellular thickening, not a hyaline transformation. Yet these thickened vessels showed numerous capillary hæmorrhages into their sheath, as well as into brain-substance. The pia mater showed also lesser degrees of cellular proliferation and intra-pial hæmorrhages.

A series of microscopic slides were shown, demonstrating the above-described lesions from these three cases of arterio-sclerosis. Also, for reference, normal ones; and also slides showing the unity of the process of hyaline degeneration, or proliferation, and then degeneration, whether occurring in the endothelial or connecting tissue cells of the dura mater, pia arachnoid, cells of the perivascular lymph space or lining endothelium of blood-vessels, of nervous tissue and its coverings.

We cannot exclude syphilis from these three cases, and in one most definite kidney disease is present. All the three cases in their way demonstrated the permeability of the smaller blood-vessels of nervous matter and brain-coverings in arterio-sclerosis, causing capillary hæmorrhage almost always, and often gross cerebral hæmorrhage as well; and incidentally, when we recognise the minute anatomy of the cerebral vessels, with their perivascular lymph courses, the pia arachnoid, a huge lymph sponge, and its vessels, and the dura mater, with its capillaries and perivascular lymph canals, we can understand that any changes, proliferative or generative, taking place in any of these systems (and they often take place concurrently), must not only interfere with the blood-supply to and from the brain, &c., but also—and this is that on which stress is laid—interferes with the lymph outflow—that is, with the elimination of products of nerve-cell metabolism and toxins of nerve destruction from the brain, a vicious cycle always to be kept in mind on the pathology and treatment of arterio-sclerosis.

I have to thank Dr. John Wallace, of the Hospital for Insane, Gladesville, for clinical histories and post mortem notes.

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THE RELATION OF HEAD INJURY TO NERVOUS AND MENTAL DISEASE.

By F. W. MOTT, M.D., F.R.S., F.R.C.P.

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THE medico-legal importance of distinguishing cause from coincidence in cases of head injury in relation to nervous and mental disease has come into increased prominence since the introduction of the Workmen's Compensation Act, and when the State Insurance Bill becomes law the diagnosis and prognosis of neuroses and psychoses following trauma and the detection of fraud and malingering, especially in cases of slight head injuries in which obvious and visible signs are absent, will be a constant source of anxiety to members of the profession.

Employers, except in the case of corporations and large companies, as a rule, insure against accident or injury to their employees; the result is that workmen and employees are more certain of obtaining adequate compensation for injuries received; for should a company dispute the claim and the case come before a jury, just as is the case when railway, bus, tramway, or other companies or corporations carrying the public are defendants in actions for damages, sympathy is generally, and sometimes not properly, felt for the individual rather than the corporation or company.

The knowledge of this fact has led to improper claims being made, and the insurance companies like the railway companies have frequently been compelled to resist the payment of unjust claims. Unfortunately this has led to just claims sometimes being classed as exorbitant, causing legal intervention, lawsuits, and much money thereby frittered away in costs to the benefit of neither party. If the medical men interested would act in the same spirit as when they are called upon to decide in a consultation what is the nature of a man's disease, what is the outlook, and how best to treat his condition, how much better it would be. Would they in their senses recommend the worry and anxiety of a lawsuit to a man suffering from traumatic neurosis or psychosis? The assessment of damages must, in the great majority of cases, depend upon the medical evidence, and it would be better if the medical men employed respectively by the injured person and the company would banish from their minds all question of damages until they had agreed upon a joint report regarding the nature of the injury, the disease caused by it, the prospect of complete or partial recovery, the temporary or permanent incapacity for employment, the liability to late after-effects, or shortening of life, and other questions which might arise were they called upon to give evidence in a court of law. Should they not agree upon any or all of the points, then before resorting to legal intervention, it would be better to agree to settle by arbitration; an expert of recognised ability and integrity being called upon to decide upon the points of variance; his opinion being regarded as final by both parties. These points having been settled, an actuary can calculate the claims more justly than a jury.

Such a mode of procedure would greatly benefit all genuine and deserving claims; unfortunately now legal intervention often leads to deserving cases being subjected to prolonged worry, anxiety, sleeplessness, and consequently bodily ill-health. A pending lawsuit to recover a just

claim by a sensitive and nervous person suffering from traumatic neurasthenia will aggravate the symptoms and lead to their prolonged instalment. As an example of this, I will relate a case that occurred in my practice:—

I was asked to see a case in consultation with the medical adviser of a 'bus company. A carman, a steady man who had not been away from his employment for thirty years, had received injuries and shock in consequence of the motor-bus colliding with a cart and throwing him violently to the ground. He received a severe shock but was able to get up, although unable to return to his work; he laid in bed and was visited by his own doctor, who took a somewhat grave view of his case; the effect of this probably was to suggest to the man that he might become paralysed, and the fear of such a condition together with legal intervention and a possible lawsuit, had led, when I saw him, to sleeplessness, general bodily ill-health, and muscular wasting. Although I could find no obvious evidence of nervous disease, yet I felt at once the man was not malingering, but was suffering from the causes I have mentioned, and was physically unfit for his employment. I ascertained that the company had no intention of resisting the claims by going into court. I advised them therefore to do their best to get the man well and offer to send him to a convalescent home for a month, and to assure him that if he did not recover completely they would provide for him until he was able to return to his work.

Medico-legal cases naturally fall into two great groups: (a) functional, (b) organic. It is with the former where the symptoms are almost, if not entirely subjective, the greatest difficulties to the medical man arise, but in many organic diseases following head injury as I shall show by actual cases, great difference of opinion may arise as regards responsibility and assessment of damages. Likewise, medical opinion may differ as to how far the resulting head injury was a prime cause, a coefficient, a contributory cause, or a mere coincident of the symptoms for which damages are claimed. Cases admitted to the general hospitals on account of head injury are usually obvious, and have severe symptoms which clear, frequently without any operative influence: of sixty-five cases of fracture or concussion admitted within the last few years to Charing Cross Hospital 22 per cent. were fatal. The remaining 78 per cent. left the hospital; in some cases they were sent to the infirmary, in other cases to their homes or convalescent homes. Mr. Fenwick, Surgical Registrar, kindly wrote to the addresses of all the cases that left the hospital, but only obtained answers from thirteen. A brief summary of these cases is given. One of the cases was afterwards admitted to Horton Asylum; he was certified and re-certified as suffering with "traumatic insanity." This patient was admitted to Charing Cross Hospital suffering with fracture of the base, extradural and subdural hæmorrhage; two operations were performed. He was afterwards discharged to Camberwell Infirmary, certified as suffering with traumatic insanity; three months after the accident he was sent to Horton Asylum. The notes on admission state that he is suffering with mania; he is confused and rambling in his conversation, with an abnormal sense of well-being and lack of realisation of his position. The question arises whether this man's insanity, which has now become chronic and incurable, is to be attributed wholly to the head injury. His wife stated that prior to the accident he had occasional attacks of drinking, and during them he became very suspicious.

and she went in danger of her life. A year ago his daughter was admitted to the asylum suffering with "Volitional insanity." It thus appears probable there were two factors responsible for this man's insanity. An inborn temperamental—the more important—and a determining or exciting factor, the head injury combined with drink. The following case reported by Dr. Robert Jones, Vol. iii, "Archives of Neurology," is of considerable interest. What becomes of a large number of these cases admitted to hospitals in London with its wide area of shifting population we do not adequately know. What, however, has astonished me is the relatively few cases that afterwards come into the asylums. There are a great number of people every year who receive very severe head injuries and a considerable number of them require operative treatment, yet comparatively few of these come into the London Asylums.

CASE 1.—Male. Aged 26. Single. Admitted to asylum from prison. Up to the age of 21 he was an abstainer and held a responsible position. He met with a serious accident, falling a distance of over 40 feet down a lift, through the bursting of a hydraulic cylinder. He was picked up unconscious and remained so for several days, having fractured his skull and sustained a severe injury to the right frontal lobe, some of the brain substance having escaped through the wound. He remained in hospital for about two months, and four months later attended St. Bartholomew's Hospital, where portions of dead bone were removed from the wound. He was under treatment intermittently for about two years, and when sufficiently well was given some light work to do, but he was found to be of no use, and eventually—about two and a half years after the accident—he was pensioned. Up to the time of the accident he was bright, active, energetic, and trustworthy. He was a life abstainer and a Sunday-school teacher. He was apparently forging his way to the front—gaining the respect of his employers, and giving general satisfaction. After the accident, however, there is a record of gradually increasing moral obliquity and mental infirmity. During this period he has been three times convicted of indecent behaviour: on the first occasion (two and a half years after the accident) he was fined; on the second he was bound over; and on the last occasion he was found guilty but insane, and was sentenced to be detained during His Majesty's pleasure. Condition on admission to asylum:—Viscera normal, reflexes normal, sensibility unimpaired; pupils equal and react to light and accommodation, no affection of the ocular muscles. He complained that his sight had become impaired for long distances since the accident. There was an irregularly depressed linear scar, 6 cms. long, vertically across the forehead. It was about 5 cms. to the right of the middle line and extended upwards through the right side of the bridge of the nose, being 5 cms. in depth in the deepest place. The right frontal bone was obviously depressed, and the skin was scarred above it. His mental state was that of organic dementia, secondary to injury of the brain. His memory was greatly impaired. He was irritable, excitable, and preferred solitude, as society worried him. He further admitted that his home, and those previously dear to him, lost their attraction for him. He had the delusion that people in the streets spoke of him; that they made signs and annoyed him by talking over his affairs; and he felt himself watched. He did not appear to realise his position and talked freely and shamelessly. It is of interest to note that the family history pointed to an insane taint; consequently the head injury may have been only partially responsible for his mental condition.

Traumatic epilepsy may be the result, and a few cases may be found in the asylums of men with trephine holes, and I have met with one case of fracture of the base which led to chronic basic meningitis and internal hydrocephalus. This case is of sufficient interest to refer to in a little detail; it accords with the statement of Koppen that a post-traumatic dementia may occasionally occur, which may be mistaken for general paralysis.

CASE 2.—J.P., age 47, shipwright. Was admitted to Poplar Hospital four years previous to admission to Claybury (June, 1897) suffering with a fracture of the skull. He was a temperate man, and prior to the accident nothing ailed him. His wife stated that the symptoms came on after the accident two years ago—"he

was wandering about the house looking for money." She had been married nineteen years, three miscarriages, one child lived nine months, no children living. State on admission:—There is an old depressed linear scar of the vertex; there was a history of syphilis and gonorrhœa; the pupils were equal, reacted to light and to accommodation; the gait was steady, co-ordination of hands good, but a coarse tremor was present; the hearing was defective, he could only hear the tick of the watch a few inches from the ear. He is suffering from dementia, states that he was in this building ten years ago; he has aural hallucinations, and some loss



FIG. 1.

of memory. He does not know where he lives; he is confused and cannot give a connected account of himself; he denies that he has been drinking much lately. States that he gets fidgetty, but not very excited or depressed. Several medical officers of experience, including Dr. Jones, regarded him as a general paralytic in the notes that follow:—July, 1897, Dr. Jones's note is as follows: He is suffering from dementia paralytica (traumatic?). He is confused and lost in his statements, rambles and repeats himself; his memory is impaired, and he has no correct knowledge of time or place; he thinks that he has been here a month, and that this is Maryland Point; his speech is hesitating, and he has a drawl, suspicious of general paralysis; his appearance is dull, vacant, and listless; talks of being smashed to pieces in a shipyard (this was true). In fair nutrition, but impaired health; his pupils barely react; his knee jerks are active; his gait is ataxic; he has large scalp scars, and several on his knees and arms; his tongue quivers somewhat, and he is sallow. Then follows note in red ink:—*Pupils equal and regular; react to light and to accommodation.* Vision R. 6-9, L. 6-6; cornea, lens and fundus normal in each eye.

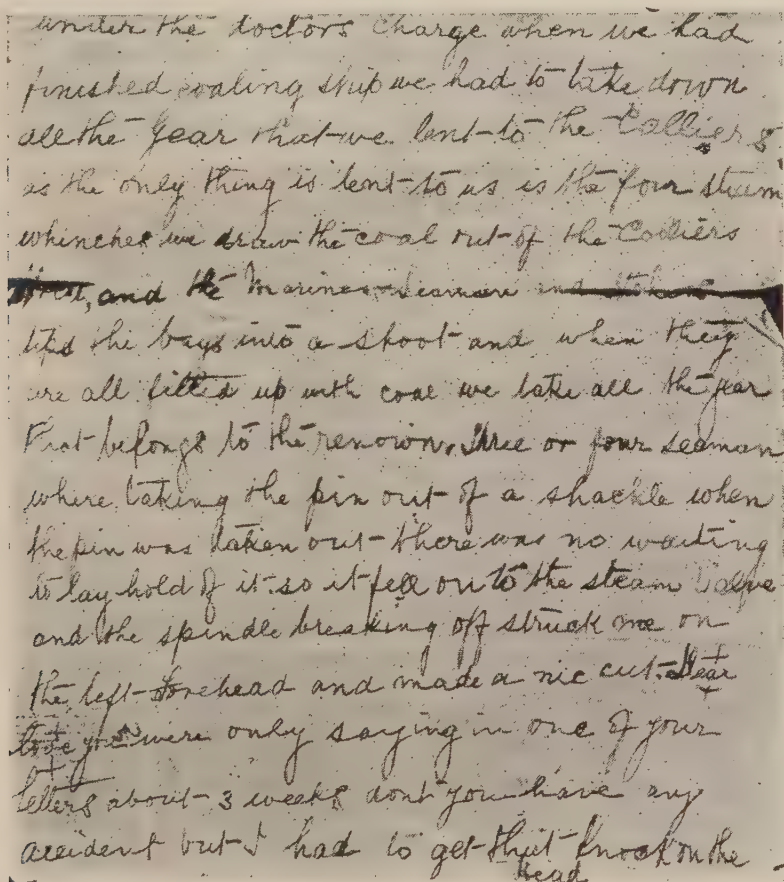
After this date the notes are such as usually occur in a case, *i.e.*, regarded as a general paralytic, and he died eighteen months after admission. It may be remarked, however, that Dr. Wollesley Lewis (15 January, 1898) stated that this was not like a case of general paralysis. The patient died of broncho-pneumonia. At the *post-mortem*, old basic meningitis, caries of the left petrous bone, and blocking of the

channels connecting ventricles with subarachnoid space; the aqueduct of Sylvius was greatly distended, and there was marked internal hydrocephalus of the lateral and third ventricles, causing marked flattening of convolutions, which were dry and sticky-looking (*vide* fig. 1). This must have led to the marked increase of intracranial pressure, causing double optic neuritis; this was discovered at the autopsy when the backs of the eyes were removed.

Again, a small proportion of general paralytics are admitted with a history of head injury which took them to the infirmary or hospital.

From a medico-legal point of view the interest does not lie so much with cases of head injuries causing (a) fracture, (b) hæmorrhage, (c) localised meningo-encephalitis resulting in organic brain disease, because there are definite signs and symptoms of the actual injury; and the paralysis or other resulting loss of function about which there can be no dispute as to its being the prime and often, indeed, the sole causal factor. It is quite possible, however, for a severe head injury even necessitating trephining to occur, and yet this may only be a coincidence or the exciting factor.

CASE 3.—W.R., age 35. Was admitted to Bexley Asylum, 28th October, 1903; died, April 20th, 1907. The patient had been an engineer's artificer in the Royal Navy. He was on the "Renown," stationed in the Mediterranean. He wrote frequently to his wife, and these letters were very affectionately worded, and denoted love for his home, his wife, and children; they showed no sign of failing intelligence or loss of the auto-critical faculty. In August he met with an accident, which is described in a portion of a letter to his wife here reproduced (Fig. 2). A month



under the doctors charge when we had
finished coaling ship we had to take down
all the gear that we lent to the Callies &
as the only thing is lent to us is the four steam
winches we draw the coal out of the Colliers
~~that, and the main beamers and~~
the big bags into a shoot and when they
are all filled up with coal we take all the gear
that belongs to the Renown. Three or four seamen
were taking the pin out of a shackle when
the pin was taken out there was no waiting
to lay hold of it so it fell on to the steam valve
and the spindle breaking off struck me on
the left forehead and made a nice cut. I hear
that you were only saying in one of your
letters about 3 weeks don't you have any
accident but I had to get that knock on the
head

FIG. 2.

later he wrote addressing his wife as Lady R., and in October, two months after the accident, as the letter (Fig. 3) shows, there are marked grandiose delusions of wealth, and the handwriting has markedly deteriorated. The comparison of those two letters shows that immediately following the accident the degenerative process, if it were present, did not manifest itself in his letter to his wife describing the accident;

within two months there was very marked signs of dementia, indicative of a degenerative process. Some time after admission to Bexley, Dr. Stansfield trephined over the frontal eminence, and it was found that the membranes were adherent at the seat of the injury. He did not benefit much by the operation. He became gradually more demented, and died three years and three months after the accident. The anatomical signs of general paralysis were found well marked *post-mortem*.

The man may have previously suffered from syphilis, and to those who believe general paralysis always to be due to syphilis the head injury only acted as the determining factor. Still it may be reasonably asserted that if this man had not met with the accident he would not have suffered with general paralysis; or at least the chances were 50 to 1 against it occurring, for only about 2 per cent. of the subjects of syphilis subsequently

[illegible]

FIG. 3.

develop general paralysis. Now there are several facts in this case which support this contention. Firstly, the man was in good health employed as a skilled artizan; secondly, the injury was the result of an accident in no way dependent upon the man's actions or state of consciousness, thirdly, letters prior to and immediately after the accident were not indicative of any mental decay; fourthly, there was a definite correlation of the accident with the onset shortly after of mania; fifthly, the patient lived more than three years after the onset. There is only one point which might be considered against the view that the accident was the determining cause, viz., the patient may have been in the preparalytic stage when the accident occurred. The only tittle of evidence in favour of this was the fact that he began his letters to his wife in an effusively affectionate manner; but then the wife said that there was no difference in his letters to those she had always received. This interesting case is the most conclusive I have met with of injury causing general paralysis. The wife unsuccessfully endeavoured to obtain some compensation from the Admiralty, and Dr. Stansfield, to whom I am indebted for the notes of this case, wrote to the Admiralty expressing the decided opinion that the accident was the cause of the mental disease.

Still it would be difficult to convince a jury that a head injury sufficiently severe to necessitate such a serious operation as trephining was not the prime cause of general paralysis, insanity, or epilepsy, and the fact that there was a history of acquired syphilis in the first-mentioned,

and a neuropathic history in the last-named would not convince the jury that if this head injury had not occurred the patient would have suffered with any of these conditions. But it is logical to assume that a man may not suffer as seriously from "*commotio cerebri*," as from a fractured skull. There may be little or no external evidence of injury to the head, nor may there be any gross nervous trouble, *e.g.*, irritation or paralytic phenomena, but the higher functions of the brain as the organ of the mind have been profoundly disturbed, for the man may have lost consciousness for some time; as a rule, he is unable to recollect how the accident happened, or the experiences of his life for some time, perhaps hours, previously, and here I may remark we can differentiate between memory and recollection. Memory is the storing away of perceptor experiences out of consciousness, and recollection is reviving by will and association the images of those experiences in consciousness. Some of these patients after they have recovered from the shock and are convalescent are able to revive in consciousness the events which happened. The great feature of "*commotio cerebri*" is the resulting inability of the brain to exercise sustained attention on account of the mental fatigue which occurs. There is disturbance of the physiological activities of the nervous elements which form the anatomical basis of consciousness. But this seat of consciousness and the higher function of the brain is the cortex cerebri, the structure latest developed.

Now, it is a fact that trauma accompanied by horrifying circumstances causing profound emotional shock and terror has a much more intense effect on the mind than the simple head injury would cause, in spite of the fact that for some time after the injured subject may be unable to recall the circumstances. There is such a thing as psychical trauma, and accepting this, we can understand how it is that a drunken man receiving a head injury under such terrifying conditions as to cause mental shock suffers less than a man who is fully conscious. A nervous breakdown may result from psychical trauma alone, and the only explanation of this which I can offer is that the whole nervous system is in a state of bio-rhythm in response to stimuli entering all the sensory avenues which arouse in consciousness feelings and thoughts by association with past experiences stored in the memory. Physical or psychical trauma, still more the two combined, destroy for a time this vital reaction of the neurones. Relatively only a few of the association memories cross the threshold of consciousness, and those that do, become vivid by attention. Since it is especially attention that uses up nerve energy of the innumerable neurones that exist in the cortex, it may be premised that the commotion of the brain either bio-physically or bio-chemically interferes with the functions of the neurones which form the anatomical substratum of consciousness. But it may be asked why is it that the memory images of earlier experiences can be recollected whereas those which happened just before and after the accident cannot? The following explanation may be offered—present experience involves a conscious perception, and the vividness and the capability of the mind of storing it in memory, and reviving it in consciousness depends upon attention, but attention involves a sense of efforts which may be regarded as the expression of the transformation of potential neural energy into kinetic energy. Perception may be likened to the chemical change produced in a sensitive photographic plate; the next perception involving attention means that

the last is no longer in consciousness, but is undergoing a process of mental fixation, which also means an unconscious using up of energy. But mental fixation (memory) depends upon association of the present with the past. All perceptions are dependent physically upon different modes of motion traversing the sensory avenues in complex and varied combinations, and the molecules of the cerebral neurones are correspondingly set in motion; there is no reason to suppose they (the nervous molecules) come to rest immediately after the external stimulus is changed; it is quite possible that the molecular movements resulting from particular external stimuli continue long after the stimulus has ceased to act, by reason of the fact that the association neurones which have previously been affected by a similar molecular rhythm are set in sympathetic vibration and thus reverberation after reverberation may occur subconsciously long after the perceptor effect of consciousness has passed away. Thus a successive series of experiences are associated in time and place, and linked up and intimately interwoven by conscious and subconscious cerebration. A sudden commotion destroys not only the vital reaction of the perceptor neurones whereby consciousness is obliterated, but breaks the chain of bio-rhythm in the association neurones upon which memory depends. According to the severity of the shock to the neurones will be the effect upon the chain of associated experiences preceding the accident.

Consequently events that happened just previously to the accident, although conscious and perceived at the time, cannot be recollected, because they have never been fixed by association. In alcoholic psychosis a similar amnesia occurs. Conscious perception of an experience occurs, but it cannot be recollected because, owing to the effect of the poison, this process of fixation by conscious and subconscious bio-rhythmical reverberation of the association neurones which form the great bulk of the cerebral hemispheres cannot take place.

Again, it is a well-known fact that a man who has suffered with a severe head injury is rendered intolerant of alcohol; a dose which previously had little or no effect, after head injury readily produces toxic symptoms. There is abundant proof therefore that "*commotio cerebri*" produces a profound disturbance in the functions of the brain (*vide* Case 4). The diagnosis of functional neuroses or psychoses and the detection of malingering is always a source of much tribulation to medical men. To form a just opinion on a case requires the exercise of a sound judgment of character, and knowledge of the previous conduct and habits of the injured person, to estimate the effects of a head injury in which all the symptoms are of a subjective character.

Again, the medical man who knows, or has ascertained that the patient is the member of a stock in which epilepsy, insanity, hysteria, or other neurosis or psychosis occurs among its members, will recognise the probability of a neuropathic tendency. If there is potential epilepsy or insanity in his patient, he will infer that a comparatively slight trauma in such an individual, such as that produced by a blow on the head, which may or may not have caused loss of consciousness, without any fracture or obvious injury of the head, is quite sufficient to cause serious symptoms in an individual predisposed to a neurosis or psychosis by an acquired or inherited *locus minoris resistentiæ* in the nervous system. Thus a man who is known to be a chronic inebriate or a subject of lead-poisoning,

or a person who has had syphilis, especially one who by his habits of life has been known to have exhausted his nervous system by sexual excesses, mental stress involved in gambling and speculating, associated with smoking and drinking—restless by day and sleepless by night—such an individual on the verge of neurasthenia receives a slight injury, and the question of compensation may arise; a certificate may be written to the effect that he is suffering with “traumatic neurasthenia,” thus implying that the injury was the sole cause of his mental condition, and a claim for compensation is made.

Again, as a result of head injury to a chronic inebriate, “delirium tremens” is not an infrequent consequence, and this for the sake of compensation claims has been termed “traumatic neurasthenia.” Indeed, so much fraud has been perpetrated under the term “traumatic neurasthenia” that many lawyers know that such a diagnosis does not carry much weight in a court of law, unless the man’s previous character and conduct is above suspicion. The medical experts employed by railway companies are fully aware that after a settlement has been effected the symptoms frequently rapidly disappear; but it does not always follow that because a rapid improvement has taken place after the claims have been settled that the symptoms of neurasthenia following head injury have not been genuine. Many patients relieved of the anxiety and sleeplessness accompanied by bodily ill-health caused by the pending lawsuit soon recover, because an important cause of the exaggeration and prolongation of the nervous exhaustion was thereby removed.

The differential diagnosis of traumatic neurasthenia from malingering is not an easy one, and it is of great importance because a man may truly be incapacitated, especially in occupations involving mental work, for a considerable time after an injury. Seeing that the symptoms may be all subjective it may be extremely difficult to decide how far they are genuine, and to discriminate them from those which might be put on, in order to obtain a better compensation; and in forming a judgment, as before remarked, previous conduct and character must be taken into consideration. A malingerer will probably overdo the symptoms; although he will say that he was stunned, he will describe the accident and the events preceding it, which we know is unusual when the accident or blow is severe enough to produce unconsciousness; instead of a mental dulness and apathy, with loss of memory, he will often show mental alertness in describing his symptoms. He may assert that he is unable to walk, or he may simulate a hemiplegia and yet give none of the characteristic signs of functional or organic paralysis. Not infrequently, however, he has heard of increased knee-jerks, and then the jerk sometimes can be elicited by striking at, but not on, the tendon. This anticipation is very suggestive of his mental attitude. Again, spurious clonus can be often detected by making the patient count slowly, then at different rates, while you are obtaining the clonus; it will then be noticed that he is unable to properly attend to two actions at the same time, and the rhythm of the clonus will vary, or the contractions become irregular and halting. A plantar extensor response may be simulated, but by suggestion it can be changed from one side to the other, or converted into a flexor response. Asked to touch the tip of his nose with his finger, his eyes being shut, he may fumble about like an ataxic would, but none of the other signs of ataxy would be present.

The less severe forms of traumatic neurasthenia are more difficult to diagnose than those with marked mental symptoms amounting to a Korsakoff psychosis. The following is a fairly typical case of true traumatic neurasthenia:—

CASE 4.—J.B., occupation, carver, aged 53. Was knocked down by a taxi-cab and admitted to Charing Cross Hospital, April 4th, 1908. On admission he was somewhat dazed, and complained of pain over the right eye and behind the left ear. There was no bleeding from nose, ears, or mouth. Shortly after admission subconjunctival hæmorrhage developed on the right side. There was pain over the right eye and behind the left ear very severe. Pupils are equal; react sluggishly to light. Pulse 92, fairly good character. Temperature 97·6. No abnormal nervous signs noted. The patient was quite sensible the next day, and subsequently made an uninterrupted recovery. He was examined three years after the accident. He even now gets headaches after rush of business, but otherwise is as well as before the accident. For six months after leaving the hospital he felt very weak and absent-minded. Before the accident he never had any complaints brought against him for slowness in executing orders, but returning to the Globe Restaurant, as carver, he was sacked after a few weeks because he forgot the orders and was slow in executing those he remembered. He was out of permanent work for a year, and three good jobs he lost on account of his inability to remember. He avoids alcohol and now is quite as well as ever. He obtained £10 as compensation, which was manifestly insufficient.

“*Commotio cerebri*,” either the result of concussion without a fractured skull or with a fractured skull may be followed by a psychasthenia due to a functional disturbance of the brain as an organ of mind. A number of cases, summaries of which are herewith reported, show that a certain group of symptoms follow the period of unconsciousness; the patients are described as being dazed and presenting mental dulness and confusion; they are unable to recollect the circumstances of the accident and the experiences preceding it—even for some hours preceding it; for months, and even longer in severe cases, there is inability to undertake any prolonged mental effort without fatigue and headache. Generally speaking, there is headache without any cause. Any mental effort requiring sustained attention, deliberation, and judgment, the subjects of traumatic psychasthenia are unable to undertake, and indecision is a frequent result interfering seriously with any occupation involving responsibility. Thus the bank clerk who could add up correctly and rapidly columns of figures without effort is no longer able to do so. He is conscious that he makes mistakes and fears that he will do so. The foreman or overseer of a workshop or a factory now will overlook more than he will oversee. Even the carver of a large restaurant—Case 4—was unable to attend to the orders of the customers and for a whole year was out of a situation. The condition is aggravated by insomnia and worry; for these sufferers of traumatic neurasthenia are conscious of their mental deficiency and are filled with apprehension of making mistakes and losing their employment, consequently they are fearful for the future, especially if they have a wife and family to provide for. If there is an inborn insane tendency, delusions of persecutions and obsessions may occur.

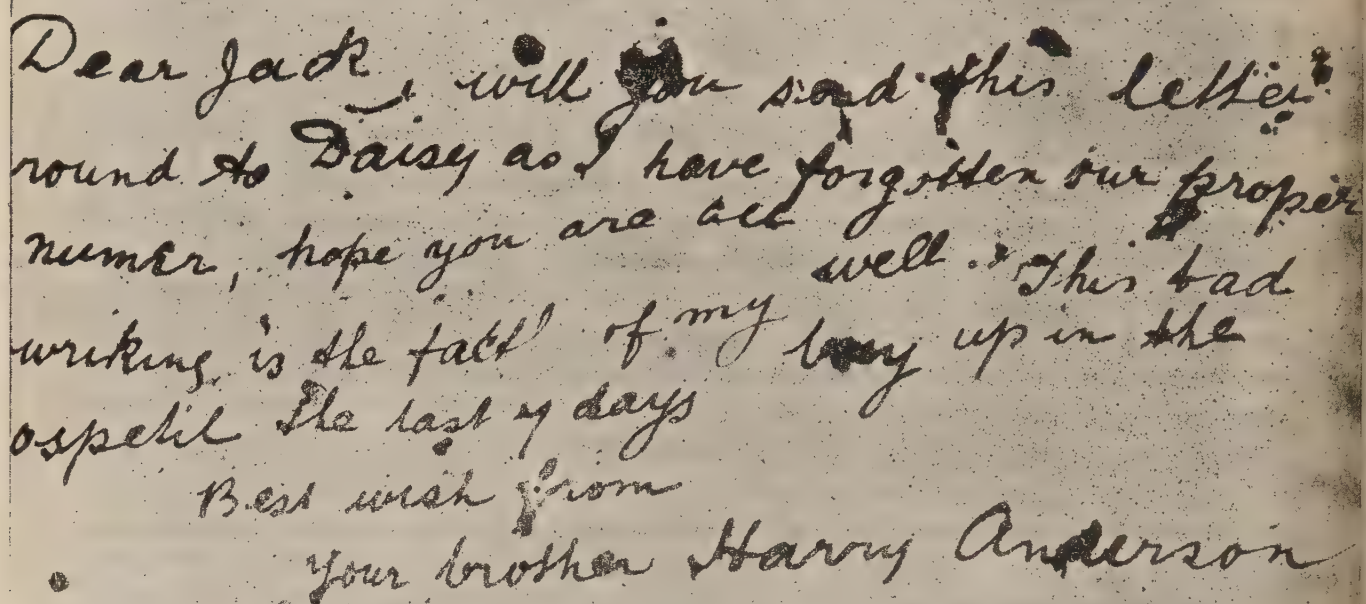
In severer cases of “*commotio cerebri*” resulting from head injury the symptoms of Korsakoff’s psychosis may occur. Thus, there may be marked mental confusion, disorientation of time and space, mistakes in identification of persons, and especially loss of memory of recent events, without delusions or hallucinations.

The common cause of Korsakoff's psychosis is chronic alcoholism; it especially affects women; and occasionally chronic inebriate women as well as chronic inebriate men are not very infrequently admitted to hospitals and infirmaries having fallen down a flight of stairs or steps, or been knocked down by a vehicle in the street, or received a head injury in a brawl. Delirium tremens or Korsakoff's psychosis may be the result; the former more likely in men and the latter in women. The patient may smell strongly of liquor or be known to the police as a chronic inebriate, such information helps in a diagnosis. The cases of Korsakoff's psychosis may come on to the asylum, and in some instances the friends attribute the mental condition to a head injury (*vide* Case 8), but I have never been satisfied that any of the cases I have seen were really primary traumatic cases. Nevertheless such cases have been recorded and do occur. I am indebted to Dr. Elgie for the notes of a case of Korsakoff's psychosis the result of head injury, which was presumably complicated by localised contusion of the left hemisphere and a patch of meningo-encephalitis beneath the seat of the external injury.

CASE 5.—“*Commotio cerebri*” and contusion of left hemisphere, followed by right-sided epileptiform convulsions, mania, and symptoms of Korsakoff's psychosis. Recovery. H.A., age 38, married, painter. Admitted to Horton Asylum 14th April, 1909. On the 16th March he fell from a ladder to the ground, the distance being about 6 feet; he was admitted to the West London Hospital the same day in an unconscious condition, with a hæmatoma and ecchymosis over the left parietal and mastoid regions, extending also to the occipital. There were no signs of fracture; no paralysis; pupils equal; knee jerks both difficult to obtain, and sluggish. He became semi-conscious, and on the 20th had a convulsion of the right side of the body lasting forty seconds. The face was first involved, and there was slight paresis of the orbicularis and tongue muscles of the left side. On the 21st he had a similar attack; he improved slightly afterwards, but on the 26th he became pugnacious and irritable, and on the 27th had to be removed to Fulham Infirmary, whence he was certified and removed to the asylum. (These attacks indicate damage to the left motor area; probably meningo-encephalitis.—F.W.M.) Condition on admission to asylum: Fairly well nourished, but pale and anæmic; rough protuberance was noted in the right upper occipital region; thoracic and abdominal viscera apparently normal. Nervous system: No motor impairment noted at first, but afterwards it was observed that he had some loss of the right naso-labial fold, and the tongue was slightly protruded to the right. The right eye was not closed so well as the left; knee jerks present, left slightly increased; ankle clonus, marked left; plantar reflex, both flexor; light touch normal; heat and cold normal; complete analgesia all over body, except face; taste and smell, both absent; pupils equal, regular, right sluggish; vision normal, fundi normal; hearing, some slight deafness left ear. The patient at first admitted having contracted syphilis, but afterwards denied it. Mental condition: He was certified as suffering from confusional insanity, and was dull, very confused, disorientated, and mistook identities; he was very slow of comprehension, rambling, and irrelevant in conversation, talking utter nonsense, and was very amnesic; no hallucinations or delusions were detected. He could not understand written questions, and was unable to read, forming words of his own; he was a good example of paralexia. Figures presented no difficulty to him; he could not write correctly from dictation, making mistakes in spelling. He had difficulty in recognising everyday objects, e.g., called a match “a light pipe,” and explained other objects by dumb show. Progress: He gradually became less confused, and could understand written questions, but still had difficulty in reading, using the wrong word at times, and words of three syllables he had to spell out. His ankle clonus disappeared, but he still had the slight paresis mentioned on admission, and the analgesia persisted. He was eventually discharged as recovered on August 27th, 1909. Treatment: Tonics and potassium iodide were administered, and he appeared to improve rapidly when taking the latter.

This case is interesting from several points of view. A man who probably had had syphilis, who was a painter, and therefore may have

had lead in his system, falls from a ladder to the ground. The injury is severe although there are no signs of fracture, for there is a hæmatoma and the man is rendered unconscious; even at the end of four days he is only semi-conscious, and then a new symptom indicative of cortical irritation occurs, viz., the convulsive seizure affecting the right side of the body associated with facio-lingual paralysis. I should judge this as being the results of a localised meningo-encephalitis due to contusion of the brain the result of the injury. Five days later symptoms of mania developed, for he became pugnacious and irritable; in the interval there had been several convulsive seizures. Later the symptoms of Korsakoff's psychosis developed. Although he was able to recognise numbers and to know their meaning, the subjoined letter shows that he was unable to



Dear Jack, will you send this letter
round to Daisy as I have forgotten our proper
number, hope you are all well. This bad
writing is the fault of my leg up in the
hospital the last 7 days
Best wish from
your brother Harry Anderson

FIG. 4.

remember the number of the house he lived in (Fig. 4). There is in the same an apology for his writing, but it was better than his verbal speech. It is quite probable that the defects of verbal and written speech which the notes indicate, may be correlated with a profound functional disturbance of the left hemisphere caused by the contusion, which was severe enough to produce irritation and paralytic phenomena in the facio-lingual area of the motor cortex and which may have affected simultaneously or have spread to the whole speech zone. It is apparent that the anterior and lower part of the speech zone was more severely affected than the upper and posterior part, for verbal speech did not recover as soon as visual typographical speech. The mental confusion and loss of orientation in time and space, together with the amnesia and the affixing of the wrong names to persons, may be the result of the profound disturbance of the whole speech zone of the left hemisphere.

The brain, however, acts as a whole, and a small localised lesion might give rise, by diaschisis, to a profound disturbance in the whole speech zone, and this is probably what happened, for had there been an extensive contusion involving the whole speech zone there would have been paresis of the arm, and recovery would not have occurred as it did. The case shows that an injury producing only visible signs of a localised external contusion may produce a profound mental disturbance. The fact that there was a possibility of predisposing toxic causes (syphilis or lead) leads to a supposition that either or both may have had something to do with the establishment of the lesion; moreover, the notes state that potassium iodide led to a rapid improvement, which supports this supposition. Still the complete recovery and the absence of any definite history of either lead or syphilis leads me to the opinion that the symptoms were all due to contusion of the left hemisphere combined with commotion of the whole brain. The fact that the localised cerebral symptoms did not come on till four days after the accident is in favour of a *localised meningo-encephalitis* and not a subdural or intracranial hæmorrhage, as in Case 7, especially as the new symptoms were accompanied by a return of consciousness.

Again, as is well known by the frequency of its happening, a person suffering from severe head injury, smelling of alcohol, may be taken to the police station and placed in a cell, and it may or may not be discovered soon enough, that drowsiness is not necessarily drunkenness, as the following very interesting case shows:—

CASE 6.—E.H., age 39, carman, Admitted to hospital 17th October, 1910; discharged 23rd November, 1910. Rupture of posterior branch of left meningeal. History:—About 3 p.m. on October 15th, 1910, patient fell from his van owing to the breaking of a rope by which he was endeavouring to hoist himself up. His head struck the road with force; he lay for a few minutes unconscious and then staggered up. A constable arrived and accused him of being drunk, and in spite of the expostulations of a gentleman onlooker, marched him off to Vine-street, a distance of 400 yards. He was certified as drunk by the divisional surgeon and placed in a cell; but later on, owing to total unconsciousness supervening, he was brought to Charing Cross Hospital on an ambulance. There was ample evidence from people to whom he had just delivered parcels that he was perfectly sober at the time of the accident. Family history and patient's history revealed nothing of note. On admission to the hospital—about 7 p.m.—the patient was unconscious; his breathing was not stertorous; there was a slight odour of spirits. The eyes rolled from side to side; both pupils reacted to light, and the left was slightly contracted. The face was pale and the skin clammy. The right side of the face showed obliteration of lines, whereas the left appeared normal, and occasionally the left angle of the mouth was drawn up. The right eye was closed (partial paralysis of the 7th only) and could easily be opened, but the left eye was tightly shut and could only be opened with difficulty. The right arm and leg lay limp, while the left arm and leg were moved occasionally, the left hand being carried to the left side of the head as if there was pain there. (He was said to have had twitchings of the right arm and leg just as he was brought to the hospital, but no medical man saw them.) Knee jerks slightly exaggerated on both sides. Flexor response on right, none on left. No tendon reflexes obtained in upper limbs. Temperature, 98° F.; pulse, 72, not very forcible. The head showed no external evidence of trauma. A few hours later the patient's mental condition improved somewhat; he appeared to recognise his wife and to attempt to speak, but did not utter any sound. Next day (16th): He was very restless, attempting to get out of bed, and turning from side to side. He appeared to understand simple commands, and would put out his tongue, which deviated to the right. He had incontinence of urine and fæces (large doses of calomel had been given). Through the following week patient's condition improved slightly; he spoke, but unintelligibly; he was less restless, temperature and pulse were fairly normal; incontinence of urine and fæces remained, so also paralysis down the right side.

Mr. Waterhouse decided to trephine on 24th: A flap was turned down and a disc of bone removed over the anterior branch of the middle meningeal and the anterior margin of a large extra dural clot was disclosed. This was removed with a scoop through the trephine opening first made, and also through a smaller hole made to facilitate the removal, about $2\frac{1}{2}$ inches behind the auditory meatus. The clot was carefully collected and found to amount to 2 oz. Patient on recovering from the anæsthetic was found to be sensible, was able to answer questions, and to recognise people. Incontinence of fæces and urine ceased, he was able to move the right arm and leg, but these limbs were very weak; paralysis of the face also remained. He rapidly made progress, and six days after the operation the arm and leg, although weak, were much stronger than formerly. The facial paralysis was disappearing, and he spoke well. On November 8th, just over a fortnight after the operation, the right-hand grip was as good as the left, and the right leg as strong as the other; there was still some paresis of the right side of the face. Tendon reflexes were normal. He was discharged on November 23rd, and was able to walk well, but it was noted that there was still slight facial paresis, that he suffered from headache on attempting to read, and that a letter written to his wife was almost illegible. He was again examined July 10th, 1911, nearly eight months after the accident: He has had no fits. For several months after the accident he felt very weak, was absent-minded, and had slight pain or twitching sensations on the left side of the head. He returned to work in February, and at first had difficulty in remembering where to deposit parcels; he would find at the end of the day that he had omitted to deliver several. He gradually improved, and now he considers that he is as good a man as he was before the accident, except that he can now only lift 1 cwt. instead of $1\frac{1}{2}$ cwt. as formerly. He says that for a month after leaving hospital his writing was very bad, and that he had difficulty in spelling—"he couldn't think how to write."

When patient left hospital he could only recollect events on the day of the accident up to lunch time, but recollection gradually returned, and about a month later he recollected the rope breaking, but not rising from the ground. He recollected being walked by the constable to Vine-street and asking the inspector what he was charged with, and being told that "he would be all right in an hour or so." His mind was a blank from that time up to when he found himself in Charing Cross Hospital after the operation. He has avoided alcohol, because of the warnings given him on leaving hospital. Nervous system: Pupils equal and react normally; no sign of paralysis anywhere; face muscles act perfectly on both sides; grip of the right hand as good as the left; and he walked well. Reflexes normal throughout. He received no compensation whatever, but was allowed half-pay and his job was kept open for him.

In this case there was only slight "commotio cerebi," the symptoms developed gradually after the accident, and were mainly due to the compression caused by the extravasated blood. Anæmia of the cortex was caused and consequent loss of consciousness, but there was in addition a local effect produced by the blood clot. During this period of compression the neurones of the cortex were unable to react to environment owing to an insufficiency of oxygen, and the mind became a blank; the brain failed as a perceptor as shown by a loss or failure of consciousness, as well as an organ of memory and recollection. But it will be noted that as soon as the cause of the compression was removed by operative measures he remembered all the circumstances of the accident and what immediately followed, but when the compression was sufficient to produce anæmia of the cortex perception and memory ceased, and his mind has remained a blank of all events happening from the time he was admitted to the hospital until the operation. Commotion therefore interferes with the vital reaction of the neurones to the circumambient medium, whereas compression stops the oxygen supply to the circumambient medium of the neurones. Remove the cause of the latter and the mind recovers, because the bio-chemical changes incidental to mentation can proceed.

Another question of great importance besides the immediate diagnosis is the prognosis; for a head injury which has produced "commotio cerebri" or concussion with fracture resulting in traumatic neurasthenia may eventually terminate in an incurable or an incurable and fatal brain disease. Several months may elapse before symptoms of traumatic epilepsy or general paralysis may come on; and if such occurred within a few months rather than immediately after, or a long time after, it may be presumed that the head injury was a determining factor in the onset of the disease. Indeed it might be affirmed, and with good reason, that had not the injury occurred the epilepsy or the paralytic dementia would not have affected the patient (Case 14). Yet as we shall see from hospital cases and asylum statistics, head injury *per se* is an infrequent cause of epilepsy, and modern investigation shows that syphilis is an essential factor in the production of general paralysis, consequently contributory determining causes must co-operate, and among these are occasionally head injuries. Still, as with epilepsy, there is in general paralysis always the difficulty of discriminating between cause and effect.

The first manifestation of both these diseases may be a sudden lapse of unconsciousness—a fit or seizure—whereby the individual may sustain a head injury. The loss of consciousness following the head injury may be due to the disease and not to the trauma. Thus a bricklayer may fall from a ladder, or an engineer's mechanic may be injured by machinery, owing to a pre-existing disease causing a lapse of consciousness; later, if he developed epilepsy or general paralysis and claimed compensation, it might be asserted with justice that the accident was in consequence of a pre-existing disease, although there was no very definite evidence to prove that he had suffered with it. Such rebutting evidence in a claim for compensation, however, could not be made if a brick had fallen on the man's head, or if a head injury resulted from the breaking of a machine (see Cases, pages 24 and 25). Again, both epileptics and general paralytics in the early maniacal stage are impulsive and quarrelsome; they are, therefore, liable to receive head injuries from blows or from being knocked down, and the wife or friends may attribute the disease to the blow.

Before dealing more especially with traumatic epilepsy, general paralysis, meningitis, tumours, and other organic diseases which may follow and be caused by head injury, I will refer to statistics of head injury in asylum practice.

Statistics of Head Injury in Relation to Mental Diseases.

Dr. Stansfield, the Superintendent of Bexley Asylum, kindly gave me the following information:—

In 7,400 admissions, since the opening of the asylum, there were 16 male cases and 20 female cases where head injury might be considered as a contributory or determining cause. He also informed me that it was his opinion that head injury as a prime cause of mental disease was extremely rare; he could only recall one of the cases where it thus acted (Case 3). Seeing that the notes taken at this asylum have been very carefully collated, this information is very valuable. But similar results were obtained at other asylums. Thus Dr. Daniel could only obtain

a history of head injury in 7 out of 919 female cases admitted to Hanwell Asylum in four years (1907-1911 inclusive). The cases were as follow :—

CASE 7.—Congenital syphilitic imbecile, with interstitial keratitis and squint, daughter of a drunken imbecile mother. The child was always backward, and suffered with convulsions in infancy; the mother attributed her mental state to a blow on the head. It is probable that this was a mere coincidence and had no causal relationship.

CASE 8.—A married woman, a cook by occupation, with a history of alcoholic neuritis and Korsakoff's psychosis, received a blow on the head. There was no sign of head injury on admission; later on she died of chronic interstitial nephritic and valvular disease of the heart. Probably the head injury was a coincidence, but there may have been some causal connection between the head injury and the onset of the psychosis.

CASE 9.—A girl, aged 17; admitted to asylum suffering with insanity of adolescence (*dementia præcox*); she received a blow on the head at the age of 8. Probably no correlation.

CASE 10.—A girl, aged 8 on admission, fell off a swing at the age of 5. A year later had an attack of biting and screaming; previously she had been normally developed, physically and mentally. There is a step-sister an epileptic imbecile in Horton Asylum. The father is intemperate. It is very doubtful whether there is any correlation between the head injury of which there are no signs, and the mental affection.

CASE 11.—A woman, aged 69; admitted February 24th, 1910. There is a history of her having been struck on the head with a flat-iron, to which her dementia was attributed by the friends, but there was a history of her having had a fit two or three months before the head injury, and she lost her memory in consequence. Besides, there had been several previous attacks indicative of arterio-sclerosis and thrombosis with softening. So that the head injury can only be accounted as a contributory factor in the production of the dementia.

CASE 12.—A single woman, aged 48, had a bicycle accident twelve months prior to admission to the asylum; the accident was followed by insomnia, giddiness at times, defective memory, and headache, with melancholic depression; in this case her insanity may be attributed to the climacteric period, and the head injury was an important determining cause.

CASE 13.—A girl, aged 15, admitted November 3rd, 1910, with a history of injury to the back of the head five weeks before admission. The certificate stated that she was a congenital imbecile from birth. The paternal uncle died at Cane Hill Asylum. No doubt the injury produced acute symptoms, for she was taken to the infirmary where meningitis was diagnosed, but these have passed off while in the asylum.

I have given a brief summary of these seven Hanwell cases in order to show how very difficult it is to assert that injury seldom, if ever, acts as more than a contributory cause in the production of insanity, and is rare even as a coefficient.

Inquiries at other asylums help to substantiate this statement thus: Sir James Moody has informed me that of 984 male patients at Cane Hill, there was only a history of head injury in 17, not 27, and when I analysed these cases I came to the conclusion that very few of the 17 had a causal relationship. At the Manor Asylum, Horton, Dr. White has been good enough to carefully examine all the case books since the asylum has been opened. All cases in which there is any mention of injury of any kind (not necessarily head injury) at any time previous to the onset of the mental disease has been listed, and yet we only find 71 out of 2,561 cases = 2·7 per cent.

I have been carefully through the records of these cases, which are nearly all females, and I find that in the majority of the cases the notes prove no relationship between the injury and the attack of insanity. Occasionally one finds an old woman is knocked or falls down in consequence of senility, or senility and drink; following this there is apparently a development of mania or melancholia or senile dementia, but how far the injury has been the cause or the consequence of the mental condition it is almost impossible to say, for the notes do not tell, as a rule, whether the patient was rendered unconscious or whether she required hospital treatment or not. There are one or two cases of interest however.

CASE 14.—C.J., aged 48, was admitted suffering with G.P.I. Seven months before admission to the asylum in June, 1908, and five months before the symptoms of insanity became manifest, an iron saucepan fell on her head. There is no history of insanity, intemperance, or tuberculosis in the woman herself or her family. Was this blow then the cause of the disease? It was only the determining cause at the most, for there was a definite history of her having contracted syphilis after marriage.

CASE 15.—A.L.P., aged 22, a congenital imbecile, fell from a swing when 5 years old, suffered with concussion, and was an in-patient at Guy's Hospital for about six weeks. Quite a few cases of epileptic or imbecile children are recorded as having fallen from a swing, and to this the mental disorder was attributed by the parents, but the medical officers who recorded these notes either were unable to pursue the inquiry further, or did not take the trouble to interview the friends and ascertain more precise particulars as to whether the scalp was cut and required stitches, whether the child was unconscious, or whether there was any evidence of fits before the injury.

I will now pass on to consider the analysis of the case book and post-mortem notes of 2,090 autopsies made by myself or my assistants at Claybury Asylum.

In none of the cases could the insanity have resulted from the head injury as the principal cause; in some it was possibly an exciting or accelerating factor. More than half the cases occurred in old people suffering, in many instances, with brain conditions due to cerebral softening or vascular disease. The notes as a rule do not state whether the injury was severe, whether there was a loss of consciousness, or, in fact, any information which would allow one to decide a causal relationship between the insanity and the head injury.

Statistics of 2,090 Autopsies in Relation to Head Injury.

In 33 cases out of 1,057 female post-mortems at Claybury, there was a history of head injury of some kind at some period of life equal to 3.1 per cent. At the autopsy in only one case was there any evidence of fracture or severe injury of the skull.

Melancholia	...	...	...	...	...	9 cases.
Senile dementia	...	...	...	...	...	7 „
General paralysis	...	...	...	...	...	4 „
Mania	...	...	...	...	...	4 „
Alcoholic insanity	...	...	...	...	...	3 „
Recurrent insanity	...	...	...	...	...	3 „
Epilepsy with insanity or imbecility	...	...	...	...	...	3 „

In 1,033 male post-mortems there were 56 cases (5·4 per cent.) in which the notes stated that the patients at some period of their lives had received head injuries. Nearly one-half of these cases were general paralytics; in fact, it is the excess of paralytics which has raised the percentage of head injuries in males so much above that in females.

General paralysis	...	...	...	...	26 cases.
Senile dementia	...	...	...	...	11 „
Melancholia	...	...	...	...	7 „
Mania	...	...	...	...	4 „
Epilepsy with insanity	...	...	...	...	3 „
Recurrent insanity	...	...	...	...	2 „
Congenital imbecility	...	...	...	...	1 case.
Tumor Cerebri	...	...	...	...	1 „
Internal hydrocephalus fracture of base	...	...	...	...	1 „
Alcoholic insanity	...	...	...	...	0 „

In only one case was a condition of injury found post-mortem which could have been the essential cause of the insanity; this was so in the case of internal hydrocephalus secondary to basic meningitis, the result of fracture of the base (*vide* p. 7). In not a few of the cases of general paralysis head injury may have accelerated the course of the disease, but there is no evidence in any of the cases of a certain causal connection between the head injury and the onset of the symptoms; and there was no case which showed that the patient was mentally perfect before the accident or injury. In many of the cases the time prior to the accident or the nature of the accident was so indefinite as to afford no support to the opinion that the head injury was related to the disease in a causal way. There was often evidence that the disease had directly or indirectly caused the injury. Thus a lapse of consciousness led to a fall, or a blow received in a quarrel in the maniacal stage. Such injuries may undoubtedly have accelerated the progress of the disease.

Statistics Relating to General Paralysis and Trauma.

It has been stated that statistics show that cases of general paralysis in which there was a history of trauma run a more rapid course; individual cases occasionally occur where it may be safely affirmed that head injury has accelerated the course of the disease. Gudden's statistics pointed to the fact that the average age of onset of general paralysis was less in cases with head injury. With a view of ascertaining if this accorded with our experience at Claybury, I have collected the statistics of general paralysis with and without a history of head injury,—and I may here remark that the notes regarding a history of head injury having occurred are more likely to be contained in the case book than the history of any other etiological cause, for the friends are able usually to afford information on this point, whereas in such matters as hereditary insanity and history of syphilis no reliable information can be obtained in a large number of cases, unless the friends are personally seen and considerable trouble taken to make inquiries; even then difficulties must arise.

Autopsies on Cases of General Paralysis.—There were 21 male private cases, and the average age at death was 46·5; among these there was not one with a history of head injury. There were 235 male pauper paralytics in whom there was no history of head injury in the notes, and the average age at death was 43·5. There were 29 male pauper paralytics with a history of head injury of one kind or another, occurring at all periods during the life of the individual; the majority, however, are stated to have occurred within a few months to a few years of the admission of the case to the asylum; the average age at death in these 29 cases was almost the same as those with no history of head injury, viz., 43·3. In only a very few instances does there seem to be any causal relationship between the injury and the precipitation of the onset or the acceleration of the course of the disease.

In 1,033 male post-mortems there were 61 with a history of trauma, and of these 29 were cases of general paralysis (the total number of male paralytic cases was 317), making about 9 per cent. general paralytics in which there is some history of a blow or a fall on the head. Of the 111 female general paralytics there were only 4 with a history of trauma, therefore less than 4 per cent.

I have carefully considered the following points in those cases where trauma has been the reported cause or contributory cause of the paralysis; and the evidence afforded by the notes in the case books, in my judgment, does not in a single instance allow one to assume that the head injury was the *principal* cause of the general paralysis from which the patient died. In some instances the destructive changes in the brain at death, together with the history and clinical symptoms, indicated a duration longer than the period of time between the date of injury and the date of death; in others, and they are not a few, the time elapsing between the date of injury and the onset of symptoms was too long to be accounted responsible as an exciting cause of the disease; in a great number of the cases the nature of the injury, whether severe enough to produce a temporary loss of consciousness or to require medical treatment is not given, nor is the time and date of the injury mentioned, so that the influence of the injury in the production of the mental disease can in no way be appraised.

As a general result of my investigations, I have come to the conclusion that head injury as an exciting cause was not of much importance either in causing the onset of general paralysis or in accelerating the symptoms. At the same time I have met with a few cases (*vide* Cases 3 and 14) where, undoubtedly, head injury may have been the determining cause of the onset of the symptoms; and it is not unreasonable to suppose that a syphilitic who, if he or she had not received some exciting cause, such as a blow on the head, might never have developed general paralysis, but these cases are extremely rare.

General paralysis may not be discovered until an accident or a head injury takes the patient to a hospital or infirmary; thus I have known the case of a prostitute who received, in a drunken brawl, a blow; she is already a paralytic at large, but not until she is taken to the hospital or infirmary on account of the injury is the nature of her affection recognised; she is then sent to the asylum.

My figures do not agree with those of Gudden's, as you observe there is practically no difference of the average age of death of those cases with a history of trauma and those without. There is one essential cause of general paralysis, and that is syphilis. All conditions which lead in a non-syphilitic subject to neurasthenia may act as exciting and contributory factors: they are sexual excesses, head injuries, alcoholism, speculating, gambling, insomnia, business worries, leading to prolonged mental excitement and insomnia, in fact all forms of nervous excitement, singly or combined, which will lead to an exhausted nervous system, especially when acting upon an inborn neurotic and erotic temperament the subject of acquired or inherited syphilis.

Head Injury in relation to Traumatic Epilepsy.

In considering the statistics of head injury in relation to epilepsy, a large proportion of the cases in which there is a history of trauma as a cause must be discounted, for the friends fail to discriminate cause and effect; again, many congenital imbecile epileptics suffer from falls or injury, and that which was due to an inborn taint or defect is attributed to the fall or injury. At the Epileptic Colony, Ewell, there are 800 cases on the books, and of these, I am informed by Dr. Collins, the Superintendent, there are, roughly speaking, 160 cases in which the friends have thought fit to mention injury, a very much higher percentage than that obtained among general paralytics, and still higher than that met with in other forms of insanity. Dr. Collins said there were about six cases out of the 160 which might be considered of traumatic origin. There is no doubt that trauma may be a cause of epilepsy, but how far the head injury is the primary and sole determining cause or merely an exciting or contributory factor in a person predisposed by an inborn taint, by alcoholism or syphilis, is difficult to decide. Very often an epileptic for some long time may have been manifesting signs of the disease unbeknown to relatives and friends; he may have had *petit mal* attacks or fits during sleep; then, perhaps, while at his employment he falls down in a fit and injures his head, perhaps severely, and remains unconscious for some time. His symptoms may now be exaggerated, the fits being more severe, or owing to the accident his friends notice his mental and bodily condition more closely, and naturally attribute all the symptoms they now see, and the fits which subsequently occur, to the head injury. Often the circumstantial evidence appears very convincing, that the head injury was the cause; but did we know all the facts, many cases in which injury was the apparent cause would be found to be really not due to the injury. Thus an epileptic imbecile died at Claybury, aged 24. She was said to have had a blow on the head at the age of 9, and the fits and amentia were attributed to the injury. At the autopsy I found bilateral microgyria and porencephalon, a congenital defect which is a not infrequent cause of epileptic imbecility. The head injury could not have taken any part in the production of this congenital defect.

Severe head injuries causing fracture of the skull and unconsciousness, some necessitating operative interference, may recover completely if they do not die within a short time of the accident; for a variable time afterwards they may suffer from the symptoms of traumatic psychasthenia, but they do not develop epilepsy unless there is some inborn or

acquired condition favouring convulsive attacks. If, however, there is an irritative lesion of the cortex in or near the motor area, a Jacksonian epilepsy may be the result, and the epileptiform convulsions of a typical Jacksonian type may, by repetition, spread so rapidly over the whole excitable cortex of both hemispheres that the fits become indistinguishable from essential epilepsy. If head injury causes a traumatic epilepsy, coming on very soon after the injury, a successful operation should cause the fits to stop. One well observed case in which all predisposing causes can be eliminated, cured by operation, would be more convincing than a large number of doubtful and badly observed cases. Raymond has asserted that traumatism can produce a partial cortical epilepsy without any appreciable lesions of the motor cortex. Petres and Kocher adopt a mixed theory that compression plays a predisposing rôle—the cerebrospinal fluid being under pressure.

Alexander has recently performed the operation of fenestrating the dura in epilepsy. Some of his cases were of traumatic origin, and he has found the membranes thickened over the motor area, and an accumulation of fluid. Epilepsy may be the result of injury to the cranial vault, splinters of the inner table are driven into the brain, or a cicatricial thickening of the membranes act as a focus of irritative discharge. It is probable that one of these conditions existed in the following case.

CASE 16.—G.F., an Italian, aged 41, was admitted to Colney Hatch Asylum two years ago. He has a fit every two or three months; he knows when they are coming on, for he has a spasm in the left foot, but faints and falls down unconscious; the fits generally occur at night; he does not know how long he remains unconscious. The fits always begin in the left leg. Five years ago he fell down a lift while acting as cook in a private family; he was taken unconscious to the hospital (Charing Cross?), and was trephined. There is a trephine hole 2 x 2½ inches just above the *left* ear and 2 inches from the vertex. After two months he was transferred to Chelsea Infirmary, where he remained two years. Three or four months after the accident the fits commenced. There is no paralysis of the right arm, leg, or face; the only evidence of motor affection is inability to close right eye independently of the left. Knee jerks present both sides, not exaggerated. He was a born left-handed man, and he says that he is unable to use his left hand as well as before the injury. These fits always beginning with spasm in the left leg, suggest either a splintering of the inner table by contrecoup or some thickening and cicatricization of the meninges and cortex, the result of contusion by contrecoup. There was no history of epilepsy or insanity or any acquired cause or factors obtainable in this case.

CASE 17.—H.F., aged 20. Admitted to Colney Hatch Asylum at the age of 19. Since 11 years of age he has suffered with epileptic fits. A gang of boys struck him over the left frontal eminence with a piece of iron. He walked home and attended the Middlesex Hospital as an out-patient for six weeks for fits, then he was admitted and trephined over the seat of the injury; only a small circular opening was made, not more than an inch in diameter. Two years after he left the hospital the fits came on. He knows when they are coming on by his head turning to the right, he gives a cry and falls down, tonic spasms or followed by clonic spasms; he does not fall into a sleep but soon gets up; he is a little irritable, otherwise there are no psychic effects before or after the fits. Neither parents suffered with epilepsy, but the father was at Hanwell Asylum and died there.

Organic Diseases determined by Trauma.

I have seen several cases of head injury in syphilitic subjects lead to a *gummatous pachymeningitis*. I have published two cases in which, following a blow on the head in the region of the parietal eminence, severe headache, sickness, and flashes of bright light on the same side as the

localised tenderness, together with pain on pressure at the seat of the injury, occurred. In both cases mercurial inunction, local and general combined, with large doses of potassium iodide, soon relieved the symptoms and eventually cured the patients. I have also published the notes of a case of meningo-myelitis syphilitica determined by trauma.

Tubercular meningitis.—Most physicians to children's hospitals consider head injuries, particularly falls, as an important determining cause of tubercular meningitis in young children and infants.

Tumours.—Cerebral tumours, tubercular, simple and malignant, are said to be determined by falls or blows on the head; the only tumours which I should definitely associate with injury would be a gumma, which, as we know, starts from the meninges. Still if there is produced by the injury a *locus minoris resistentiæ* with congestive stasis and extravasation, there is no reason why, as pointed out by Dr. Colquhoun, of Dunedin, a suitable nidus for the development of parasitic organisms or cancer germs is provided, and on that account head injuries may be the determining cause of growths of all kinds. I may say, however, that there was only one case of growth in the 89 cases of head injury among the 2,090 autopsies, which is about the same proportion as among the non-traumatic cases.

Meningitis non-tubercular.—Fractures of the base of the skull may occasionally give rise to an acute or chronic meningitis (*vide* Case 2).

I will now pass on to a consideration of general paralysis of the insane, the most important organic disease from a medico-legal point of view. In fact, a number of cases of claim under the Workmen's Compensation Act have occurred recently in the London County Asylums, brief abstracts of which I will give, as each one illustrates some one or more points of medico-legal interest.

Summaries of some recent general paralytic cases in which claims for compensation were made.

I. Compromised claim for compensation.—A man who was employed by a newspaper company delivering papers, was knocked off his bicycle by collision with a car; shortly after the accident he was sent to Colney Hatch Asylum, and died two months later. An inquest was held, and the finding of the jury was that the injury had precipitated but had not caused the disease; this conclusion was arrived at from the post mortem examination, as the changes in the brain were much too advanced to have occurred within the short period of time since the accident.

II. Unsuccessful claim for compensation.—A builder's clerk received a slight head injury; while unloading wooden bricks one bounded up and struck him on the head; he walked to the hospital, and had a slight scalp wound dressed. Shortly after he was admitted to Claybury Asylum, where he died two months after the accident. At the autopsy a recent *pachymeningitis hæmorrhagica* was found. The question arose was the pachymeningitis the result of the blow on the head with the wooden brick? The wife admitted mental derangement had existed for some time prior to the accident. The hæmorrhage appeared more recent

than two months. Many cases of general paralysis show *pachymeningitis hæmorrhagica* in which there is no history of trauma. Consequently the wife was unsuccessful in the claim for compensation.

III. Compromise by the Railway Company in an action by the wife of a railway guard.—The man was admitted to Cane Hill Asylum suffering from general paralysis. The wife attributed the disease to an injury sustained in a shunting accident. Evidence was obtained by the company to the effect that prior to the accident the man had been strange in his conduct, and, therefore, the injury had not produced the disease. As rebutting evidence it was shown that the medical adviser to the company had seen the man and examined him, and had ordered him back to his work. The case, therefore, did not come into court, the company compromising the claim.

IV. Successful action for damages against a Railway Company by the wife.—The employee of the company was engaged in unloading a truck; he slipped, it is said, and struck his head against an iron bar. According to the evidence of the doctor who attended him, the blow was a slight one, and not sufficient to set up organic brain disease. Several doctors were called to give evidence, including a specialist, who saw the man at the hospital, but did not remember the case. He expressed the opinion that syphilis was an essential factor, but that a blow might act as the exciting cause. The County Court judge gave as his judgment:—"It is clear to my mind that the blow did have an effect upon him, and I do not see my way, in the evidence before me, to say that the effect of the blow has been sufficiently compensated for, and that had there been no blow the man would have been in the condition he is. In these circumstances I put no period to the effect on the incapacity as the result of the accident, and I think the company should pay 13s. 8d. per week from the date on which the last payment was made, and continue to pay."

V. Unsuccessful action by wife for compensation.—This case was of interest for several reasons. It was proved that the man met with the head injury owing to his interfering with another man's work. There was a definite history of syphilis, and both the cerebro-spinal fluid and the blood was examined by an expert, and he gave evidence in court to the effect that both gave a positive Wassermann reaction. Judgment was given against the wife, the reason being, that the man had not met with the accident while attending to *his* occupation; moreover the judge remarked that he was not satisfied that the injury was the immediate cause of the insanity.

No doubt the Wassermann reaction will in future play an important part in medico-legal actions arising from claims for compensation in organic disease of the nervous system. It is, therefore, important that some definite understanding should be arrived at as to the methods to be employed and the value of the test. From a considerable experience based upon observations made by my assistant, Dr. Chandler, and Dr. Henderson Smith, of the Lister Institute, upon cases under my care at Charing Cross Hospital and in the London County Asylums, I have come to the following conclusions:—

1. The original Wassermann method is the most reliable.
2. Four dilutions should be made.

3. In the case of the cerebro-spinal fluid not less than 0.5 cc. should be used, and 1 cc. is desirable before we can be sure of a negative result.

4. If the blood serum does not give a positive result, the cerebro-spinal fluid will be negative. On the other hand, if the cerebro-spinal fluid gives a positive result the blood serum will also.

5. In general paralysis 97 per cent. of the cases gave a positive result of the cerebro-spinal fluid accompanied by a lymphocytosis. The correctness of this percentage, which is similar to that of Plaut, has been proved to be correct by post-mortem macroscopic and, if necessary, microscopic investigation of a large number of the cases of general paralysis to which the test had been applied.

6. If the blood serum gives a positive Wassermann reaction and the cerebro-spinal fluid show a lymphocytosis, but gives a negative Wassermann reaction, it is greatly in favour of the disease not being either general paralysis or tabes, but a gummatous meningitis which may clinically be a pseudo-general paralysis or pseudo-tabes case. I have published several cases in my Morison Lectures proving the truth of this statement.

7. It is not safe always to assume that a case is not syphilitic or, at any rate, will not yield to anti-syphilitic remedies because the blood serum yields on several occasions a negative reaction. I have occasionally seen instances in support of this statement. A case of ophthalmoplegia interna and externa gave a negative serum reaction on several occasions, yet in three weeks was completely cured by mercurial inunction and large doses of iodide.

8. The Wassermann reaction may disappear under the influence of "606," or mercury, and again reappear.

9. The serum reaction is not nearly so significant as that of the cerebro-spinal fluid from a diagnostic point of view.

10. The examination of the cerebro-spinal fluid in general paralysis is most valuable; it may be necessary to make lumbar puncture more than once to obtain the reaction. Occasionally, but very rarely, even then, a negative reaction may occur; this may be due to excess of cholesterol, at least that is the explanation I should offer tentatively. Cholesterol is always present when nervous tissue is breaking down; this possesses anti-hæmolytic properties, consequently excess might interfere with the action of the globulin substance that causes the deviation of the complement. This globulin may be removed by dialysis, by heating, or by precipitation with alcohol, and the fluid then no longer gives a positive reaction.

There are many other points to which I might have called attention, but I will content myself by thanking the Superintendents of the London County Asylums and my surgical colleagues at Charing Cross Hospital for the kind assistance they have given me. Also particularly I desire to thank Mr. Fenwick, Surgical Registrar, for kindly interviewing a number of patients who had been admitted at some previous time for head injury and who had been discharged. A summary of these cases is appended.

The after results of thirteen cases of severe head injury admitted to Charing Cross Hospital.

* Loss of consciousness at the time of accident.

** Continuance of unconsciousness for some hours after admission.

None of these cases of fracture suffered later with fits.

1. Rupture of middle meningeal posterior branch. Operation, recovery. Seen eight months later: memory had returned for all events which happened up to the time when signs of compression occurred, but during this time till operation "all is a blank."

2. Fractured base. Extradural and subdural hæmorrhage (?). Rupture of cavernous sinus. Two operations. Dementia, persistent. Man in Horton Asylum.

3. Compound depressed fracture of vault. Operation; nine months after accident, memory enfeebled, liable to severe headaches, depressed and nervous.

*4. Fractured base. One year after operation: recovered in every way except unable to remember well.

**5. Fracture of base and vault. No operation. Eight months after accident, headache, weakness, dizziness, nervous and depressed, memory very bad. Four months later, improved and returned to work.

**6. Fractured base. Two years after, severe headache, worse if worried or subjected to noise, lack of power of attention, and memory much impaired.

**7. Concussion. One year ten months after accident: lack of concentration of attention, subject to headaches, unable to take interest in matters.

*8. Fractured base. Three years after accident: severe headache after rush of business, unable to give sustained attention for six months, out of work for one year. Gradual improvement, now quite well.

**9. Fractured base. Two and a half years after: memory still very bad, cannot recollect names of friends or places, insomnia, but no headache.

**10. Fractured base and concussion. Nine months after: returned to work three weeks after accident, no effects now.

*11. Fractured base. Three years four months after: "as good a man as ever," out of work four months.

*12. Depressed compound fracture of frontal bone. Operation elevation. Discharged nine days after admission, recovered; five years after accident, still quite normal.

*13. Compound depressed fracture of vault. Extradural hæmorrhage. Operation, complete recovery.

SOME PRELIMINARY NOTES ON TEST MEALS IN THE INSANE.

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THE fact that many acute cases of insanity are admitted in a low state of general nutrition, and fail to improve on treatment, suggested the idea of having their gastric juice tested. It was determined, if possible, to do 100 cases, depressed ones for choice, with suitable controls from ourselves and some general hospital cases. To obtain the meal, three-quarter hour after administering Ewald's, a round of toast and 500 c.c. of water or weak tea, a stomach tube was used, attached to an aspiration bottle 10 oz. capacity, with a Higginson's syringe reversed attached to one glass tube, as suction power. This answered admirably. Often up to 280 c.c. were obtained. If just before removing test meal 10 grammes of grape sugar were given in 20 c.c. of water, the amount or percentage of same in test meal would give amount of test meal left behind, sometimes of value to know. Mr. Gray, of the Physiology Department, suggested this, and we have found it very easily done.

We examined for the following:—

- (a) Whether well chewed and digested, presence of mucus in excess, blood or bile or other pigment, foreign foods, smells of special nature, lactic acid.
- (b) Microscope showed, perhaps, remains of previous meals—i.e., muscle fibres, vegetable matters, organisms of a special nature, sarcinæ, &c.
- (c) Free HCl, proteid combined HCl, organic acids, total acidity.
- (d) Active HCl (protein combined and free) and mineral chlorides.
- (e) Digestive power of the juice on carmine fibrin.

After the meal is withdrawn it can be filtered through several folds of fine-meshed butter cloth, but better through filter paper. and, as the last portion to filter through is generally stronger, best left till all has filtered. Of course, if the food sediments quickly, it may be easy to pipette enough clear juice beneath the mucus.

There are many reasons why filtered test-meal or gastric juice should be used. The food contents and mucus varies so much, and, quite apart from the juice, exercise their own effect upon alkali. Sahli and Volkard both recognise its results are reliable, and it must be used for Töpfer's method. If higher fatty acids be smelt and suspected, unfiltered juice must be taken, because higher fatty acids will not filter.

In the absence of free HCl, mucus is nearly always increased as HCl digests and dissolves it; much mucus considerably interferes with the withdrawal of the test meal. Lactic acid can be tested by Uffelmann's test—better Strauss's, with separating funnel and ether; blood by spectroscope or guaiacum test; absence of free HCl always meant undigested food; special organisms showing special infection or at least if in excess, gastric immobility, or delayed mobility. Boas oppler bacilli in lactic acid excess.

Quantitatively.

Free HCl, &c., were estimated by Topfer's method: 10 c.c. of filtered gastric juice, burette with $\frac{N}{10}$ NaOH solution, and using for free HCl a $\frac{1}{2}$ per cent. solution of dimethyl amido azo benzol in 50 per cent. alcohol; three drops as in indicator; the deci-normal soda solution was run in until the pink (due to free HCl) became a urine yellow, which did not become lighter on further addition of alkali. This number of c.c. soda solution, multiplied by ten, gave the equivalent free HCl in gastric juice. Similarly using $\frac{1}{2}$ per cent. solution of phenolphthalein, one gets the total acidity, proceeding till a permanent delicate pink obtains.

Twenty drops of a fresh-prepared 1 per cent. solution of soda alizarin monosulphate in a q. dist. will similarly give all the acid bodies in the juice except protein combined HCl, proceeding until the amber becomes a royal purple, not getting darker on adding more alkali, so that the total acidity, minus this last figure, gives the protein combined HCl. The difference between the sum of HCl free and combined from the total acidity gives the organic acids and phosphates. In dimethyl readings under 15.0 the HCl free figures may be in excess, for the phosphates may be increased and sufficiently concentrated to affect dimethyl. Lactic acid, too, in great excess will affect dimethyl. But the end point is very indefinite, and it would at once be suspected. In these cases a "gunsburg" test should be done.

The Proft. Wynter method depends on free HCl being driven off when 10 c.c. of juice is heated in a platinum crucible over a water-bath or sand-bath.

Three crucibles being taken—A, B, C.

- A. Evaporated and incinerated at once, equ. mineral chlorides only.
- B. Evaporated, and then chlorine free sat. sod. carb. solution added, evaporated and incinerated, equ. mineral chlorides and protein HCl.
- C. Had sod. carb. sol. added at once, and is then evaporated and incinerated, equ. total chlorides.

By mutual subtraction we get—(x) Free HCl; (y) protein HCl; (z) mineral chlorides.

As a matter of fact, we have done so many test-meals by both Topfer's method and this, and where there has been plenty of free HCl, that we are quite certain the HCl free does not get driven off, but unites with the residue at boiling point, or is retained somehow. We have also tested thus made up test-meals. When the organic acids are small in amount and free HCl in abundance, one can evaporate such a gastric juice, and the total acidity after evaporating will often appear almost unaltered. Therefore, now we just do tests crucibles A and C giving us the mineral salts and the two HCl's, together often called the active HCl. This figure is generally about 10 per cent. more than Töpfer's figures.

We found porcelain crucibles $1\frac{1}{2}$ inches across answered admirably, and cotton-wool saturated with hot distilled water filtered very well. The method was to take up the incinerated ash with HNO_3 , add 10 c.c. AgNO_3 , hot aq. dist., filter as above, and titrate filtrate with $\frac{N}{10}$ ammonium sulphocyanide, using iron alum as indicated, end reaction a brown colour, and subtract amount of sulphocyanide from 10, and multiply by 10.

We found this is a useful check on Topfer's method, and did Hehnon-Maly's modified method with ether and $\frac{N}{10}$ NaOH in abs. alcohol when fatty acids were present.

To test the peptic powers, which usually follow the curve line of the free HCl , we took three tubes (A, B, and C), placing a bit of carmine-coloured bullock's fibrin hardened in alcohol, preserved in glycerine in alcohol, washed before use in water, into each of the tubes.

Also place in A, 2 c.c. of gastric juice and 2 c.c. water.

Also place in B, 2 c.c. of gastric juice and 2 c.c. 4 per mille of HCl .

Also place in C 4 c.c. of gastric juice.

Place all these in a water-bath at 37. Then C should go coloured first, and usually in one minute, and dissolve in twenty minutes. If not, the result was that HCl was deficient or in excess. Normal gastric juice contains so much pepsin that even if diluted thirty-six times, if appropriate HCl be added, it digests almost as well as the normal. Many juices from the insane and physical conditions will not stand this test; pepsin or some other similar ingredient is absent or diminished.

We have tested some eleven normal test-meals from six people, and the results conform very well; but our figures do not nearly reach Webster's of 100 total acidity, including free HCl 50 degrees, protein combined HCl 25, and rest 25, while they do closely follow those of Panton and Tidy, published since this work was done.

Our average for normals run 28 free HCl ; $4\frac{1}{8}$ about protein HCl ; $40\frac{1}{2}$ for total acidity; and $7\frac{1}{8}$ about, for the organic acids and phosphates by difference. It is here seen that the organic acids are a small ratio, while the free HCl is nearly seven times that of the protein HCl . We have only been able to obtain gastric juice from some twenty-four cases of insanity, mostly cases depressed, but also including some cretins and G.P.'s. It is noted that at once the greater numbers show a lessening of the free HCl to the combined ratio, and a general lessening of the free HCl . In some cases this is remarkable, and Webster states that in any case any great diminution of free HCl , even when protetin HCl is plentiful, calls for further inquiry.

Three tables are included, showing the free and combined HCl by Topfer's method, and the active HCl by Prout Wynter's method, Volkard's modification, active HCl meaning free and combined together, also total acidity, and by difference the organic acids and phosphates in normal controls, physically ill patients from a

general hospital, and fifteen of the more striking results out of the twenty-four patients from hospitals for insane. It will be noticed that while many of these patients have very little total HCl, yet some having but little free HCl have quite a lot of protein combined, that apparently meaning that some HCl is secreted, but is immediately taken up by the foods, and their gastric secretive power fails to produce that abundant excess of free HCl so characteristic of health. It is unreasonable to suppose that all these folk have true organic bases for their trouble, and we should expect the condition to improve with the mental symptoms, aided, perhaps, by exhibiting free HCl, pepsin, pancreatin, strychnine, sanatogen, and such-like preparations, daintily-served foods, fresh air, and suitable exercise and rest. I have to thank Dr. Moore Sampson, of Rydalmere Hospital, and Dr. Johnston, of Callan Park, for their trouble in obtaining these test-meals, and Drs. Chapman, Flashman, and Mr. Gray for many valuable hints and criticisms.

TABLE A.—Normal Cases.

Number of Case.	Nature of Case.	Dimethyl acidity = Free HCl.	Protein HCl by alizarin.	Last 2 counts together.	"Active" HCl. Silver nitrate method.	Total acidity. Phenophthalein.	Difference between T.A. and active HCl = organic acids and phosphates.	Remarks
29	.....	18.	7.	25.	...	28.	3.	Vomited, mixed with saliva.
33	.....	26.	4.5	30.5	30.	34.	3.5	Removed by tube.
35	.....	31.	6.	37.	...	42.	5.	" "
39	.....	28.5	2.5	31.	36.	38.	7.	" "
40	.....	20.	6.5	26.5	30.5	31.5	5.	" "
34	Attendant ...	36.	14.25	50.25	49.	64.	13.75	" "
41	" ...	19.5	10.	29.5	35.	39.	9.5	" "
36	Student ...	31.	3.	34.	36.	44.	10.	" "
42	Attendant ...	32.	6.	38.	45.	48.	10.	" "
43	Porter ...	29.	1.5	30.5	28.	37.	6.5	" "
44	Farmer ...	36.	3.5	39.5	51.*	45.	5.5	" "

* At times partly through the number of manipulations and partly to presence of ammonium chloride in gastric contents, the method with silver nitrite gives an acidity greater than the T.A. by phenophthalein and also chemical changes due to heating. (Panton and Tidy).

TABLE B.—Patients from general hospital, with severe symptoms.

30	Gastric pain, Indig'tion	12.	0	12.	14.	20.	8.	Vomits after eating.
31	" " ...	16.	...	...	25.	26.	1.	
32	" " ...	5.	5.5	10.5	14.5	15.	4.5	Vomits, emaciated.
37	" " ...	0	2.	2.	...	6.	4.	Anæmic and thin.
38	" " ...	0	0	0	...	5.	5.	Emaciated.
13	Chronic gastritis ...	7.	0	7.	9.	18.	11.	Vomits mucus; losing weight.
14	Repeated ...	6.	...	...	12.	28.	16.	After washing out night before.

Number of Case.	Form of Insanity and Condition.	Dimethyl acidity = Free HCl.	Alizarin acidity from T.A. = Protein HCl.	Last 2 columns together.	Silver nitrate test for "active" HCl.	Total acidity.	By difference—Phosphates and organic acids.	Remarks.
3	Mania (depressed)	0	...	...	4.	7.	3.	No digestion; much mucus.
4	" "	4.	...	...	34.	48.	14.	
8	" "	0	...	...	10.	8.5*	...	Poor digestion.
5	Melancholia, Acute	0	...	...	43.	51.	8.	Food unchewed.
10	" "	4.	...	...	14.5	16.	1.5	Died soon after.
15	Mania e potu	16.	...	...	33.	44.5	11.5	After repeated stomach lavage for months; 29 years an alcoholic.
16	" "	5.	...	...	2.	102.†	97.	Cancer of pylorus at P.M. (Chlorides, mineral, in excess). Abundance lactic acid.
12	Mania, Chronic	7.	...	...	10.	25.	15.	Much mucus.
9	Epileptic depressed	6.	...	...	32.	38.	6.	
17	Delusional Insanity	7.5	...	...	14.	17.	3.	Poor digestion.
20	General Paralysis..	0	2.	2.	2.5	3.	0.5	No digestion.
25	" "	0	9.5	9.5	8.	30.	20.5	"
22	Cretin	0	4.5	4.5	10.	22.	12.	"
23	" "	0	3.	3.	6.	7.	1.	Gunsburg negative.
21	Paranoia	6.	13.	19.	20.	30.	11.	Tube fed.

N.B.—Active HCl=free and protein HCl together.

† Mineral chlorides greatly increased.

* At times partly through the number of manipulations and partly to presence of ammonium chloride in gastric contents, the method with silver nitrate gives an acidity greater than the T.A. by phenolphthalein and also chemical changes due to heating. (Panton and Tidy).

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IX.

SECTION OF DISEASES OF CHILDREN.

PRESIDENT'S ADDRESS.

By A. JEFFREYS WOOD, M.D. (Melb.).

IN opening the proceedings of the Section of Diseases of Children, it is my first and most pleasant duty to express my most cordial thanks for the honour that has been conferred on me in electing me President of this Section. Although my professional work has been confined strictly to practice amongst children for the past twenty-four years, I feel that I lack many essentials to properly fill the position I find myself occupying; however, I recognise fully that in accepting the position I can count on your cordial assistance to help me through with the work of the Section, and I trust that when the week's work is at an end we will all feel the benefit of exchanging our ideas on the many subjects that are to be brought forward for our consideration.

A Section of Diseases of Children was first created at the annual meetings of the British Medical Association and the American Medical Association, thirty-four years ago.

In the first round of the meetings of the Australasian Medical Congress, Melbourne, included a Section for Diseases of Children under the Presidency of the late Dr. William Snowball, and I well remember the scanty attendance at the meetings of that section. In fact, the interest shown at that time was so slight that subsequent Congresses eliminated the Section of Diseases of Children, and it remained for Melbourne to once more try the feeling of members of the Congress on the subject when we last met in 1908. ■

The success that attended the second attempt was undoubted, and I sincerely trust that Sydney will prove to other centres that this section has come to stay on our programmes as long as Congresses are held throughout Australasia. At this stage I might be allowed to say that one of the most interesting features of Congress work to visitors from the country and other cities is to see the practical details of modern treatment in the various diseases seen amongst children. Clinical demonstrations of cases illustrating modern methods are of far more practical value to medical men attending these meetings than listening to papers being read. We have inaugurated a Pediatric Society at the Children's

Hospital, Melbourne, where we hold monthly meetings, and the wealth of clinical material that is brought before members is most keenly appreciated, and the discussions following the actual handling of the cases is of the greatest value to the whole staff. We have started a library of pediatric literature, and hope soon to have a well-equipped lecture hall, with lantern and other modern conveniences. The American Pediatric Society was established in 1889, and the English Society for the Study of Diseases of Children was established in 1900. These societies do an immense amount of good work, and, no doubt, we will have an Australian Pediatric Society some day with annual meetings in the various cities of the Commonwealth, but the small meetings of the members of the staffs at the various Children's Hospitals throughout Australia will be the first nuclei for the formation of the larger society. When the history of this most interesting branch of medical work is some day recorded, the name of the late Dr. William Snowball, of Melbourne, will be written in large letters. It was he who first started in Melbourne the interest of younger medical men in this branch of medicine, and those of us who had the privilege of working with him will never forget his keenness in urging everything that helped to improve the knowledge of diseases of children amongst his pupils.

It is possible, apparently, judging from the calendar of the Sydney University for a man to take his M.B. without attending a single demonstration of diseases of children, and he is certainly not submitted to any examination on the subject by the University.

Considering that three-fifths of a general practitioner's work will most probably consist of children's diseases and their treatment, this state of affairs calls for alteration. In Melbourne twelve attendances at a children's hospital are compulsory, and the students show their appreciation of the work by a letter they have recently forwarded to the faculty of Medicine of the University, in which they ask that arrangements should be made to increase the compulsory attendances to twenty-four, giving as a reason that their future work when in practice will be benefited thereby.

In Adelaide it is compulsory for all students to attend a course of clinical instruction on diseases of children at the Adelaide Children's Hospital, and hold the office of surgical dresser and medical clerk at the same hospital for a period of two months. The course at the Adelaide Medical School is now practically a six years course, hence the extra time practicable for this most essential work. No examination is held in this special subject: In instructing students set lectures are, I am sure, a mistake; their day is past. Clinical instruction in the Out-patient Department and in the wards with practice in the use of the stethoscope, forehead mirror, intubation and washing out tubes, are what they want, and what they keenly appreciate. With these few introductory remarks, I have much pleasure in opening this session.

AN INVESTIGATION INTO THE RELIABILITY OF VON PIRQUET'S CUTI-REACTION IN CHILDREN UP TO THE AGE OF 13, IN A SERIES OF CASES.

By E. S. LITTLEJOHN, M.D.

IF a small dose of tuberculin be injected under the skin of a non-tuberculous individual, no effect, either local or general, is produced.

If a small dose of tuberculin be injected under the skin of a tuberculous individual, a local reaction is produced, in the form of hyperæmia and œdema at and around the site of injection. If a large dose be injected, as well as the local reaction, there is a focal reaction, in the form of a hyperæmia of the tuberculous focus, and, as a consequence of this, there is also a general reaction, due to auto-inoculation from the tuberculous focus, and evidenced by a rise in temperature, malaise, headache, various pains, and anorexia.

Hence the injection of tuberculin may be used as a diagnostic test of the presence or absence of tuberculosis, and it may also be used as a means of treatment, as a vaccine, the injected products of the tubercle bacillus leading to the production of anti-bodies, not only directly, but, further than this, through the focal hyperæmia produced, causing an auto-inoculation with the products of the tubercle bacilli in the focus of disease, and thus stimulating the production of anti-bodies indirectly. Further, the focal hyperæmia allows of the direct access of the anti-bodies to the tuberculous focus.

Von Pirquet, in 1907, described a new clinical test for tuberculosis in the form of an inoculation of the skin with tuberculin.

He stated that if the skin of a non-tuberculous individual be inoculated with tuberculin, no effect whatever is produced. But if the skin of a tuberculous individual be inoculated, there is a local reaction in the form of hyperæmia and œdema round the site of inoculation. No focal reaction is produced, and no general reaction. This test has received the name of Von Pirquet's cuti-reaction.

Why tuberculin should cause a local reaction is not definitely known, though several theories have been advanced to explain the fact. E. C. Hort, in a recent article, states that the local reaction is the expression of an increased susceptibility, or lowered resistance, or anaphylaxis, of the tissues of a tuberculous subject to the action of the products of the tubercle bacillus, and that it is the detection of this anaphylactic state that is the basis of the diagnostic use of tuberculin.

This, however, is inconsistent with the facts that in cases of acute and general tuberculous infection, when the resistance of the tissues is presumably at its lowest, Von Pirquet's reaction is often absent, whereas in cases of mild and quiescent disease, with no clinical manifestations, where the resistance is presumably high, the most marked reactions occur. Another suggestion, which better explains

the facts, is that the local reaction is the result of the interaction between the products of the tubercle bacillus at the site of inoculation and the free anti-bodies in the blood. Hence it would be most marked in cases of quiescent disease where anti-bodies are plentiful, and would be absent in cases of acute and general infection where probably no free anti-bodies are present.

There is no doubt that Von Pirquet's test does not discriminate between active and quiescent tuberculous disease, most marked reactions occurring in cases of quiescent disease with no clinical manifestations. But for this reason, it becomes a very delicate test of the presence of a quiescent tuberculous focus.

Since the first announcement of Von Pirquet's test, much doubt has been expressed as to its reliability, and many conflicting statements have been made as to the facts regarding the reaction, and as to the best technique to employ.

It has been stated that a positive reaction may be obtained in the absence of tuberculosis; that the test is only reliable up to the age of 3; that all individuals over the age of 2 years give a positive reaction, whether tuberculous or not; that the result is always **positive** on a second attempt, owing to the absorption of some **tuberculin**; that the test is not altogether free from risk; that it is not reliable in cases of tuberculosis associated with much pyrexia, or in the presence of a superimposed intoxication or infection; and that it is unreliable in cases of severe or general tuberculous infection.

So recently as July, 1910, at a discussion on the subject in London, as to the reliability of the local tuberculin reaction, it was stated by one of the speakers that "he was aware when he expressed doubt he was saying what few of them dared to whisper at the present moment, but which he believed they would soon be shouting from the house-tops."

Having regard to the extreme simplicity of the test, and its peculiar applicability to young children, owing to the absence of focal and general reactions, I have endeavoured to make a comprehensive inquiry into the truth of these statements, and to determine the reliability or otherwise of the reaction, and its limitations.

With this object in view, I have tested all the children admitted to the Royal Alexandra Hospital under my care during the past twelve months, excepting only those that were moribund, or were not expected to live for more than a day or two.

A continuous series of 395 medical cases was thus submitted to the test. Dr. MacDonald Gill also kindly placed twenty-three of his cases at my disposal, and, owing to the kindness of Drs. Clubbe and Binney, I had the opportunity of testing fifty-two surgical cases suffering from probable or possible tuberculous disease of the bones, joints, glands, and genito-urinary organs. The total number amounted in all to 470 cases.

The following special points for determination were considered:—

1. Is a positive Von Pirquet reaction reliable?
2. Is a negative Von Pirquet reaction reliable?
3. Is there any limitation as to age in regard to the reliability of the test in children?
4. Does any harm ever result from the test?
5. Is it true that the test, though negative in the first instance, when repeated is positive, in the absence of tuberculosis, owing to the absorption of some tuberculin?
6. Does the presence of pyrexia, in cases of tuberculosis, affect the reliability of the reaction?
7. Is the test reliable in cases of severe or general tuberculous infection?
8. Is its reliability affected by the presence of a superimposed intoxication or infection?
9. What is the relation between the degree of reaction and the degree of infection?
10. Can tuberculosis of human and bovine type be discriminated between by the reaction occurring only with the appropriate tuberculin?

Technique.—The method originally recommended by Von Pirquet was as follows:—An area of skin on the flexor aspect of the forearm being cleansed with ether, a drop of a 25 per cent. dilution of Koch's Old Tuberculin in glycerine, with 5 per cent. carbolic acid added, was placed on it, and rubbed into a skin abrasion made by boring the skin through the drop with a blunt instrument, such as a probe. A similar abrasion treated in like manner with a drop of glycerine, or sterile normal saline, was used as a control.

A positive reaction was defined as the development of a red papule in the abrasion treated with the tuberculin, generally within twenty-four hours, and always within forty-eight hours, and lasting five or six days, while the control abrasion remained unchanged.

This technique has been modified in various ways by different observers; some scarifying the skin with a sharp lancet, and others with a needle. Some have asserted that the drawing of blood should be expressly avoided, and others that this makes no difference. Some, instead of a 25 per cent. solution, have used the tuberculin undiluted. In many cases the observer has claimed better results for his own particular method.

The present series shows that all that is necessary is to observe absolute asepsis, and to ensure access of the tuberculin to the local capillary circulation by removing the impenetrable horny epidermis, and whether this is done with a lancet, or a needle, or by boring with a blunt instrument, matters not in the least.

The drawing of blood does not interfere with the reaction in any way, but it is obviously better to avoid this, as the resulting red scratch might be mistaken for a slight reaction, and unnecessary pain is caused.

The technique adopted in this series was as follows:—An area of the skin on the flexor aspect of the forearm was cleansed with rectified spirit, and three parallel scratches were made just through the horny epidermis, about 1 inch long and about $\frac{1}{2}$ inch apart, with a needle previously sterilised in a spirit flame.

The middle scratch was used for the test, and the two outer ones as controls.

Into the middle scratch was rubbed a drop of undiluted Koch's Old Tuberculin, T.O.A., with a probe sterilised in a spirit flame, and into the outer ones a drop of sterile normal saline.

The area was then covered with an aseptic pad and a bandage.

Rectified spirit was found to be quite effective in sterilising the skin, as no inflammatory reaction occurred in any of the control scratches, except in one instance, in the case of a boy who was covered with impetiginous sores, and who was known to have got his hand under the pad.

When the reaction is negative, all three scratches remain precisely the same, with no sign of redness or œdema whatever, and have generally quite disappeared in four or five days.

When the reaction is positive, while the control scratches remain quite unchanged, the middle scratch, into which the tuberculin has been rubbed, becomes red and inflamed, generally within twenty-four hours, and always within forty-eight hours, and develops into a raised red œdematous band, generally about $\frac{1}{4}$ inch in width, which is palpable to the finger. This red œdematous band reaches its summit by the third or fourth day after the inoculation, and then begins gradually to subside.

It remains visible and palpable for a period varying from four or eight days to three weeks, according to the intensity of the reaction, generally about one week from the inoculation, and leaves a dusky, slightly desquamating stain on the skin which gradually fades away.

Some observers state that in some cases in both control and tuberculin-inoculated areas a "pseudo-reaction" occurs in the form of a narrow red ring, which appears after twenty-four hours, and always disappears by forty-eight hours; but in none of my 470 cases did this pseudo-reaction take place.

The reaction was always either absolutely negative, or definitely positive, with a raised red œdematous band lasting two or three days at least. There was considerable variation in the degree of redness and œdema in different cases, but both were always present, and of at least two or three days' duration.

In all probability "pseudo-reactions" are due to imperfect asepsis.

RESULTS.

1. *Is a positive Von Pirquet reaction reliable?*

Of the series of 418 medical cases, twenty-three gave a positive reaction, and 395 a negative, giving an incidence of tuberculosis of 5.5 per cent.

Of the twenty-three positive reactions, the first occurred in a feeble, puny infant of four months, suffering from pneumonia, and with a tuberculous family history; but owing to the low condition of the child no further test was applied.

The second occurred in a boy of 6, admitted for epilepsy. He was further tested with a subcutaneous injection of Koch's Old Tuberculin, and to $\frac{1}{2}$ m.g. gave a marked local reaction, and a general reaction to 101.4 degrees. He then underwent a course of treatment with subcutaneous injection of T.R., and rapidly put on weight, and grew rosy, fat, and well.

The third, fourth, fifth, and sixth were all admitted suffering from endocarditis.

The third was a boy of 3, whose father was suffering from phthisis. He was further tested with subcutaneous injections of Old Tuberculin and to 2 m.g., and gave a marked local reaction and a general reaction to 102 degrees. As he was taken home by his parents he received no tuberculin treatment.

The fourth was a boy of 11, who, when further tested, gave a marked local reaction and a general reaction to 102 degrees to 1 m.g. of Koch's Old Tuberculin. He received a course of treatment with T.R., and put on weight, and markedly improved in health.

The fifth, a girl of 11, when further tested subcutaneously, gave a marked local reaction, and a general reaction to 101.4 deg., with 5 m.g. of Koch's Old Tuberculin. She was submitted to a course of treatment with T.R., with the greatest possible benefit to her health, becoming fat and rosy and well.

The sixth was also a girl of 11, whose mother had died of phthisis. She gave a marked local reaction to $\frac{1}{2}$ m.g. of Old Tuberculin, subcutaneously, and was then put on a course of treatment with T.R., to which she responded by putting on 1 stone in weight in a month, and improving greatly in general health.

It is suggestive that out of a total of twenty-three cases of endocarditis, four should have proved to be tuberculous. In two there was a definite rheumatic history, but in the other two there was none, and it is possible that some cases of endocarditis may be of a tuberculous nature, especially as in the latter two cases there were indefinite signs at one or other apex of the lung.

The statement has frequently been made that cardiac disease is an absolute contradiction to the use of tuberculin; but these cases entirely disprove this statement, as the three that received tuberculin treatment were all markedly benefited by it. In no case did the cardiac bruit appear to be affected in any way.

The seventh, eighth, and ninth were cases of gastro-enteritis in young infants.

The seventh was a girl of 1 year and 4 months, who also had signs of broncho-pneumonia throughout both lungs, and who died in a week with symptoms of acute general tuberculosis; but no *post mortem* examination could be obtained. The reaction in this, as in all acute cases was very slight.

The eighth was a female infant of 8 months, whose mother had died of phthisis two months previously. She also had signs of broncho-pneumonia, and died in three weeks, no *post mortem* examination being obtainable.

The ninth was a male infant of 13 months, whose mother was dying of phthisis. He was discharged in a fortnight apparently well.

The tenth, eleventh, and twelfth were admitted suffering from meningitis.

The tenth, a girl of 3, died five days after admission, with what was clinically tuberculous meningitis, but no *post mortem* was obtainable. A lumbar puncture performed on admission afforded a clear fluid, which was found to be sterile.

The eleventh, also a girl of 3, died ten days after admission, also from what was clinically tuberculous meningitis. A lumbar puncture performed on admission afforded a slightly turbid fluid which was found to be sterile. A *post mortem* was performed in this case, and tuberculous meningitis was found to be present.

The twelfth was a boy of 6, who died after an illness of three weeks with typical symptoms of tuberculous meningitis. Clear sterile fluid was obtained on lumbar puncture.

The thirteenth was a boy of 6, who had been ailing for a fortnight with malaise and a slight rise in temperature which had been supposed to be due to typhoid. A Widal test, however, proved negative, and he was discharged apparently well in ten days, no further test having been applied.

The fourteenth and fifteenth were cases diagnosed clinically as tuberculous peritonitis.

The fourteenth, a boy of 2 years and 7 months, apparently a typical case of tuberculous peritonitis, was discharged well in six weeks, no further test, for various reasons, having been applied.

The fifteenth was a boy of 4. When tested further with Koch's subcutaneous test he gave a marked local reaction, and a general reaction to 100 degrees with a dose of 1 mg. Old T. He was then treated with T.R., but grew steadily worse and died in six weeks. A *post mortem* was performed, and tuberculosis of the peritoneum and abdominal glands was found to be present.

The sixteenth was a girl of 7, who was admitted suffering from hæmaturia of three weeks' duration, and was very pale, thin, and ill. When tested further, she gave a marked local reaction, and a general reaction to 100 degrees, with 4 mg. of Old T. subcutaneously. She was then put on a course of treatment with T.R., and gradually improved and put on weight. At the end of six months she was fat, rosy, and well, the urine having been free from blood and albumen for some weeks. The dose of T.R. to begin with was $\frac{1}{1000}$ mg., and this was gradually increased, reaching 1 mg. in six months. No tubercle bacilli were discovered at any time in the urine. This case is in opposition to the statement made that severe nephritis is an absolute bar to the use of tuberculin.

The seventeenth was a girl of $3\frac{1}{2}$, who had been suffering for some weeks from cough, wasting and diarrhoea, and had an enlarged liver. She had been sleeping for some months in the same room with an aunt suffering from phthisis, whose sputum swarmed with tubercle bacilli. This girl died in three weeks with signs of general tuberculosis. No *post-mortem* could be obtained.

The eighteenth was a girl of 7, who was admitted suffering from symptoms which had been attributed to typhoid. A Widal test proved negative on two occasions. Her father was suffering from phthisis, and she herself had early signs at the right apex. She gave a marked local reaction to $\frac{1}{10}$ mg. of Koch's Old T. subcutaneously, and was then put on a course of treatment with T.R. She was discharged in two months, having put on 1 stone in weight, and being apparently quite well.

The nineteenth was a pale, thin, and miserable-looking boy of 6, who was admitted suffering from an attack of acute colitis. He gave a marked local reaction, and a general reaction to 99.5 degrees to a dose of mg. of Old T. subcutaneously. He was then put on a course of T.R., giving marked reactions at first, and at the end of five months was fat and well.

The twentieth was a boy of 5, admitted for an attack of acute pneumonia. When further tested, he gave a marked local reaction, and a general reaction to 102 degrees to a dose of $\frac{1}{4}$ mg. of Old T. subcutaneously.

The twenty-first, a girl of $5\frac{1}{2}$, also suffering from pneumonia, gave a marked local reaction to $\frac{1}{2}$ mg. of Old T. subcutaneously.

The twenty-second, a boy of $1\frac{1}{2}$, was admitted suffering from pneumonia. He had a marked angular curvature of the spine, and had been under treatment for tuberculous spinal disease for nine months.

The twenty-third was a girl of 5, suffering from pneumonia.

Thus, of the twenty-three cases giving a positive reaction to Von Pirquet's test, all of those who were further tested by Koch's subcutaneous test, namely eleven, also gave a reaction to this.

Of these eleven, seven were markedly benefited by a course of T.R. Of the remaining four, one died, and was found, *post mortem*, to be suffering from tuberculous peritonitis, and the other three, for various reasons, were not treated with T.R.

Of the twelve cases that were not submitted to the subcutaneous test, one was found, *post mortem*, to have died of tuberculous meningitis, two died of acute general tuberculosis, two died of what was clinically tuberculous meningitis, one was clinically a typical case of tuberculous peritonitis, and one was suffering from tuberculous spinal disease with an angular curvature.

That is, eighteen out of the twenty-three cases giving a positive Von Pirquet reaction were certainly tuberculous.

Of the remaining five, in the case of one, an infant of 8 months, the mother had died of phthisis two months previously; in the case of another, an infant of 13 months, the mother was dying of phthisis; and in the case of a third, an infant of 4 months, there was a tuberculous family history. This leaves only two lacking in facts confirmatory of the reaction.

In these twenty-three cases, where not otherwise stated, there were no clinical manifestations of tuberculosis; this was the case in twelve out of the twenty-three. In these the tuberculosis was latent, being confined probably to the bronchial or abdominal glands.

In the cases of acute and general tuberculosis, the Von Pirquet reaction was very slight, and the most marked reactions were obtained in the cases of latent tuberculosis with no clinical manifestations. These facts are entirely opposed to the theory that the local reaction is the expression of an increased susceptibility of the tissues of a tuberculous subject to the action of the products of the tubercle bacillus, and is strongly in favour of the theory that it is the result of the interaction between the anti-bodies in the blood of a tuberculous individual, and the products of the tubercle bacillus, at the site of inoculation. Hence, in acute and general tuberculosis, where the anti-bodies are presumably all or nearly all combined with the toxins of the bacillus, the reaction is absent or but slight, whereas in latent and quiescent tuberculosis, where there are plenty of anti-bodies to spare, the reaction is most marked.

B.—Of the series of fifty-two surgical cases suffering from probable or possible tuberculous disease of the bones, joints, glands, or genito-urinary organs, twenty-nine gave a positive reaction, and twenty-three a negative.

Of the twenty-nine positive reactions, only two were submitted to the subcutaneous tuberculin test, and both reacted also to this. One of these was proved subsequently by operation to be tuberculous.

Twenty of the remainder were operated upon and proved to be tuberculous, and six were clinically typical cases of tuberculous disease of either the spine or hip. The remaining one had been ailing for over a year with indefinite symptoms.

Thus, of the twenty-nine surgical cases giving a positive reaction, twenty-eight were certainly tuberculous.

I think, therefore, we are justified in concluding from these fifty-two positive reactions in medical and surgical cases, that a positive Von Pirquet reaction is entirely reliable; and, further, that it is a very delicate test of the presence of a latent or quiescent tubercular focus. It is further evident that it to some extent aids in diagnosis between active and latent tuberculosis, being slightest in the most active, and most marked in mild and latent cases.

2. *Is a negative Von Pirquet reaction reliable?*

Of the 418 medical cases, 395 proved negative. Of these, 321 were discharged cured, eighteen were discharged with various incurable affections, and fifty-six died.

Fourteen cases, in which there was some doubt as to the presence of tuberculosis, were submitted to a further test by the subcutaneous injection of tuberculin, and **all failed to react to this.**

Of the fifty-six fatal cases, *post-mortem* examinations were made in nine, and in six of them no tuberculosis was found to be present, while two were found to have died of tuberculous meningitis, and one of general abdominal tuberculosis. In one, which subsequently died of what was clinically tuberculous meningitis, tubercle bacilli were found in the cerebro-spinal fluid, obtained by lumbar puncture, in large numbers.

Of the remaining forty-six, four died of lobar pneumonia, two of broncho-pneumonia, two of heart disease, twenty-seven of gastro-enteritis, one of typhoid, seven of acute suppurative meningitis, one of whooping-cough, one of congenital syphilis, and one of lymphatic leukæmia.

Of the fifty-two surgical cases, twenty-three gave a negative reaction. Of these, nine were further tested with the subcutaneous test, and all proved negative to this; five had had indefinite joint symptoms of only a few weeks' duration, and made a rapid recovery; seven were found at operation to be suffering from septic arthritis or osteitis; one was found at operation to be a case of non-tuberculous enlargement of the mesenteric glands, and one proved to be a case of bacillus coli infection of the urinary tract.

The conclusion from these cases, therefore, is that a negative Von Pirquet reaction is reliable, except in cases of acute and general

tuberculosis. Out of seven cases of tuberculous meningitis, three gave a negative reaction, and out of three cases of general tuberculosis, one gave a negative reaction. It is evident, also, that the Von Pirquet reaction is a valuable aid in diagnosing between tuberculous and chronic non-tuberculous joint affections in children. Chronic joint affections in children have for the most part been blindly accepted as tuberculous, but it is now known that a considerable number of them are due to other organisms, such as the typhoid bacillus, the influenza bacillus, and the staphylococcus albus.

3. *Is there any limitation as to age, in regard to the reliability of the test in children?*

One statement that has been made is that the test is only reliable up to the age of 3, and that after that age a large proportion of children give a positive reaction.

Another statement is that all individuals over the age of 2 years give a positive reaction.

Of the total number of 418 medical cases, 217 were above the age of 3 years, and 201 below.

The number of positive reactions in the 201 cases below 3 years of age was 8, giving a percentage of 4.

The number of positive reactions in the 217 children between 3 and 13 was fifteen, or about 7 per cent.

The incidence of tuberculosis among children, of course, increases from year to year of age; the increase from 4 per cent. in children below 3 to 7 per cent. in children ranging between 3 and 13 is a perfectly natural one, and is markedly less than that recorded in most European countries.

I, therefore, conclude that the reliability of the test is in no way affected by the age of the child, and that the statement that a large proportion of children over the age of 3 give a positive reaction, is in no way supported by the above mentioned facts.

4. *Does any harm ever result from the test?*

It has been stated that the test is not altogether free from risk.

This question may be considered from the point of view of the effect of the test on children of very early age, in conditions of extreme debility and lowered vitality, and suffering from severe and acute illnesses. Seventy-nine cases were below the age of 1 year, and twenty-five of these were only 3 months old or under. One child was only 2 weeks old, one was 4 weeks, and seven were 8 weeks.

Forty-six of the seventy-nine were in a condition of extreme wasting and debility from gastro-enteritis, and twenty-two of the forty-six were also suffering from severe acute illness in the form of either lumbar pneumonia or broncho-pneumonia.

In no single instance did any harm whatever result from the test, either locally at the site of inoculation, or generally, in either the positive or the negative reactions.

Neither in any of the cases of acute or general tuberculous infection did any harm result from the test, and I think it may be definitely stated that it is entirely free from risk.

5. *Is it true that the test, though negative in the first instance, when repeated is positive in the absence of tuberculosis, owing to the absorption of some tuberculin, as stated by some, or owing to a local hyper-susceptibility being produced by the first inoculation, as stated by others?*

To decide this question, thirty cases that had given a negative reaction were tested a second time at an interval mostly of two or three days, but in some cases of seven to ten days, and all without exception again gave a negative reaction.

Ten were tested a third time, and again gave a negative reaction, and four still proved negative on the test being repeated a fourth time.

I think, therefore, that the statement that a second test is always positive is effectually disposed of by this evidence.

6. *Does the presence of pyrexia, in cases of tuberculosis, affect the reliability of the reaction?*

There were four cases of certain tuberculosis with temperatures ranging between 100 and 102 degrees at the time the Von Pirquet test was applied, and these all gave a positive reaction.

There were thirty giving a negative reaction, with temperatures ranging between 102 and 104 degrees, and of these the only cases that subsequently proved to be tuberculous were cases of tuberculous meningitis, in which all observers are agreed the test is unreliable.

So far as this series is concerned, therefore, there is no evidence that the presence of pyrexia interferes with the reaction.

7. *Is the test reliable in severe or general tuberculous infections?*

There were three cases of acute general tuberculosis, two giving a positive, and one a negative reaction; and there were seven cases of tuberculous meningitis, four giving a positive and three a negative reaction.

It is, therefore, evident that the test is not reliable in cases of severe or general tuberculous infection, probably because in these cases there is little or no free anti-body present.

8. *Is its reliability affected by the presence of a superimposed intoxication or infection?*

The test was applied in ninety-two cases of acute lobar pneumonia, seventy-six of gastro-enteritis—twenty-two of which were also suffering from lobar or broncho-pneumonia—thirty of enteric, two of diphtheria, five of whooping-cough, six of congenital syphilis, and twenty-five of rheumatic endocarditis.

Of the cases of pneumonia, the only one giving a positive reaction had a tuberculous family history. Of the cases of gastro-enteritis, three gave a positive reaction, one of them dying of acute general

tuberculosis; in the case of the second, an infant of 18 months, the mother was dying of phthisis; and in the case of the third, an infant of 8 months, the mother had died of phthisis two months previously.

Of the cases of rheumatic endocarditis, four gave a positive reaction; all four also gave a positive reaction to the subcutaneous test; in the case of one, the mother had died of phthisis; and in the case of another, the father was suffering from phthisis. Three of them were markedly benefited by a course of T.R., the fourth not being treated with tuberculin owing to the supervention of mumps rendering discharge to another hospital necessary.

All the other cases were negative, and there was no evidence whatever to suggest the presence of tuberculosis in any of them.

It has been stated that a positive reaction occurs in cases of congenital syphilis, but in none of these six cases was a positive reaction obtained.

I conclude from these cases, therefore, that the reliability of the test is in no way affected by the presence of a superimposed infection or intoxication.

9. *What is the relation between the degree of reaction and the degree of infection?*

The most marked reactions were obtained in cases where the tuberculosis was latent, with no clinical manifestations, or where the tuberculous focus was apparently quiescent, or of very limited extent.

Very marked reactions were obtained in a case of tuberculosis of the cervical glands, and a case of tuberculous ulcer of the bladder, both of which left the hospital apparently cured. A very marked reaction was obtained also in a case of hip disease which had been operated on some time previously, and in which the disease was apparently quiescent.

The slightest reactions were obtained in the acute and general infections. Of the two cases of tuberculous peritonitis, one, giving a very marked reaction, recovered, and the other, giving a very slight reaction, died, widespread abdominal tuberculosis being found *post mortem*.

Of the four cases of tuberculous meningitis giving a positive reaction, in three it was very slight, and in the fourth moderate.

The two positive cases of acute general tuberculosis both gave a very slight reaction. It would seem, therefore, that the intensity of reaction varies inversely with the intensity of infection, and that a marked reaction is of favourable prognosis, indicating the presence of a considerable amount of free anti-body.

10. *Can tuberculosis of human and bovine type be discriminated between by the reaction occurring only with the appropriate tuberculin?*

It has been maintained that tuberculosis of human type will give a reaction with human tuberculin, and not with bovine; and that, on the other hand, tuberculosis, if of bovine type, will react only to bovine tuberculin.

To determine the accuracy or otherwise of this statement, fifty-six cases were tested with both Koch's Old T. and the corresponding tuberculin of bovine type, P.T.O.; in fifty of them, the reaction was negative to both, and in six it was positive to both.

In no case was a reaction obtained with either human or bovine tuberculin only, but it was observed that in the positive cases the reaction to bovine tuberculin was in every instance much less marked than the reaction to human tuberculin, which in these cases was very marked.

These cases, therefore, do not support the contention that human and bovine tuberculosis can be distinguished by means of the test.

CONCLUSIONS.

I think it may be fairly concluded that the Von Pirquet test, owing to its simplicity and entire freedom from risk, has a distinct sphere of usefulness among children.

The fact that it is unreliable in cases of acute and general tuberculous infection is very little to its disadvantage, as in these cases the diagnosis is for the most part manifest, and treatment with tuberculin is in any case inapplicable.

On the other hand, it is apparently a test of great delicacy in cases of mild and early tuberculosis, and though it does not discriminate between latent or quiescent and active tuberculosis, it is nevertheless of great advantage to be made aware of the presence of a potential tuberculous focus. The degree of reaction, moreover, is of prognostic value.

It also has a most useful application in aiding in the diagnosis between tuberculous and non-tuberculous chronic infections of the bones, joints, and glands. Chronic infections of joints and bones in children have hitherto been accepted without question, for the most part, as being tuberculous; but it has been definitely proved that many of them are not tuberculous, but are due to other organisms, such as the typhoid bacillus, the influenza bacillus, and the staphylococcus albus.

THE DIAGNOSIS AND TREATMENT OF TUBERCULOSIS IN CHILDHOOD.

By J. MACDONALD GILL, M.D.

THERE is, unfortunately, no doubt about the frequency of tuberculosis in childhood. I propose in this paper to discuss, first, in brief, the paths of infection, as far as they can be deduced from clinical observation; secondly, the forms in which it presents itself clinically; and thirdly, the diagnosis and treatment.

Post-mortem examinations in Sydney show clearly that the primary seat is almost always the bronchial lymph glands. I have never made a post-mortem examination in a child dead of tuberculosis in which the primary seat of the disease was other than the bronchial lymph glands. It is necessary to be sure that the caseous glands are not overlooked, as may very readily happen. It is best to remove the lungs and heart from the thorax *en masse*, and not separately as is often done; then they should be turned over so that the posterior surface is uppermost, and any hard masses felt for at the bifurcation of the trachea and incised. These masses may be no larger than a marble, and readily escape notice unless especially looked for. I have laid stress on this point, as I have seen them overlooked in post-mortem examinations by inexperienced observers. In every post-mortem on a child these glands should be carefully examined, as they are often the only structure affected with tubercle. Post-mortem evidence of infection by the bowel is rare in Sydney; so rare that I have never seen an undoubted instance. Again, tubercular peritonitis is rare here; much less common than in London, for instance. During the last four years, two cases only have been under my care at the Children's Hospital. One of these recovered under treatment, and the other was taken home by the parents and died shortly afterwards. Dr. Still's statistics from the Great Ormond-street Hospital show that nearly 30 per cent. appear to have been infected by the bowel, and 64 per cent. by the air passages. Dr. John Thomson showed from a comparison of statistics published by the various children's hospitals that tubercular peritonitis was a rare disease outside Great Britain; from these statistics it seemed to be about ten times more common in Britain than in Canada or the United States. Koch himself asserted that if the experience of the children's hospitals (presumably in Germany) was carefully examined, not one case of primary infection by the bowel had been satisfactorily established. It is, therefore, clear that as far as Sydney itself is concerned, we must look upon infection by the air passages as the rule, though perhaps not invariable. Whether the British experience, which differs so strikingly from ours and that of America, is dependent upon the greater incidence of infection by the bovine type of bacillus, remains to be proved.

We now come to our second heading, viz., in what forms does it present itself clinically? I refer only to such cases as come under the care of a physician. Such enlargement of the bronchial

glands as one gets in tuberculosis, generally quite moderate, can very rarely be accurately diagnosed clinically. Only twice in my experience has a diagnosis been made. In one case, a child was admitted with physical signs of pressure on the left bronchus—*i.e.*, a diminished entry of air over the left base—with some rhonchi; afterwards the child developed dulness and other physical signs suggestive of tubercle. The tuberculine test was applied, and he reacted to 102 degrees with 5 milligrams. I shall refer to his case later on in more detail. The second case was admitted for whooping cough; but the violence of the paroxysms suggested the real cause, more especially as no remedy gave any relief. The child died of exhaustion after a few days. At the post mortem a large mass of caseous bronchial glands was found. In this case there was no opportunity for using the tuberculine test, as the child was only under observation two or three days. Time and again these caseous glands have been found in the post-mortem room in cases in which their existence had never been suspected during life. We have therefore to rely upon the tuberculine test, should one have any reason to suspect their presence. The most common form in which tuberculosis presents itself clinically in children is meningitis. This should be looked upon as a terminal event, and is probably always fatal. I have not attempted to treat any such cases with tuberculine. A few words on diagnosis are not out of place. As any physician to a children's hospital knows, a diagnosis of tubercle meningitis cannot be based on symptoms alone. A diagnosis based on symptoms can only be a probability at the best. One might as well try to diagnose tuberculosis of the lungs from symptoms alone! The tuberculine test does not help one, as in these advanced cases of tuberculosis the characteristic tuberculine reaction, in whatever form used, may not take place. A lumbar puncture may help, rather from a negative than a positive standpoint. One cannot expect to find tubercle bacilli in the puncture fluid, but generally a considerable quantity of clear fluid, with perhaps a few lymphocytes, but seldom tubercle bacilli, in our experience. As these cases usually do not react to tuberculine used diagnostically, one cannot expect them to react favourably to tuberculine used therapeutically.

The next definite type of tubercle in childhood is pleurisy, with effusion. As in adults, this is usually, but not invariably, of tubercular origin. It should be clearly recognised that the pneumococcus may produce a clear pleural effusion. A proper cytological and bacteriological examination of the fluid will usually settle the matter; if not, the tuberculine test can be used. This form of pleurisy is not common in children. It follows a similar course to that in adults, except that invasion of the lung occurs more rapidly. I have had two cases treated by tuberculine.

Tuberculosis of the lungs in children is generally diffuse, and is seldom localised to the apex as in adults. When it gives any physical signs they are merely the signs of bronchitis. Cavitation is rare. I have only one, a boy of 16, with a cavity a little below the apex in the right lung posteriorly. In this case the diagnosis was easy,

as there was profuse expectoration showing tubercle bacilli in abundance. It is obvious in this case that the approximation to the common adult type was due to his greater age. We shall refer to this case more fully later on.

We shall next consider diagnosis. This, in the almost universal absence of sputum, depends entirely upon the tuberculine test. Of the various methods of applying the test, I myself place most reliance upon the subcutaneous tuberculine test, as originally used by Koch. The child should be kept in bed, and the temperature taken every four hours; in many cases the temperature becomes normal after a few days. If the temperature remains normal, we proceed to carry out the test in this fashion: The injection is made into the forearm under the skin, one-fifth milligram being used for the first injection, a local as well as a general reaction being looked for. The reaction generally appears within twelve hours of the injection, but may be delayed for twenty-four hours, but never more than forty-eight hours. The local reaction is a definite redness and swelling of the skin around the seat of injection. If there be no sign of a reaction, we wait two days, and give a second injection of one-half milligram. If there be no reaction to this we give 1 milligram, then 2 milligrams, 5, and finally 10 milligrams. If there be no reaction to the final dose of 10 milligrams one may be quite certain that tubercle is absent. If there be a doubtful reaction, repeat the same dose after two days; if the reaction is still doubtful, let the next injection be the next higher one on the scale. Koch himself recommended beginning with a tenth of a milligram in children; but we consider that unnecessary, and have found the plan given above quite satisfactory. Even with this gradual increase of dose an unnecessarily severe reaction may be obtained. However, even a severe reaction is recovered from in a few hours. We have never seen any evil results follow. A difficulty is presented by cases in which the temperature does not drop after a prolonged rest in bed. We have succeeded in arriving at a diagnosis in some cases by observing the local reaction only; or the temperature may rise a degree or two above the average level after an injection of tuberculine. However, if the temperature be not normal this mode of applying the tuberculine test is apt to be fallacious. We must then fall back upon the skin reaction of Von Pirquet, which is undoubtedly of great value in children. We have altogether abandoned the use of the conjunctival reaction of Calmette. Exactly the same information may be obtained by the skin test of Von Pirquet more easily and without any risk. The tuberculine test in children is absolutely necessary if one wishes to have any success in treatment. Without it, diagnosis is mostly a matter of guesswork.

Treatment.—We can now consider the last and chief part of this subject, viz., treatment. There have been seven (7) cases altogether in which the tuberculine treatment has been carried out; and in every one the treatment has been completely successful. The preparation used has been generally T.R. (Koch's). In the later cases I have used the bacillus emulsion of Koch. T.R. becomes expensive

when one uses the larger doses; but it is particularly suitable for children, as it is a mild preparation, and children are very sensitive to tuberculine. I generally begin with a dilution of 1 in 2,500, using as a first dose $\frac{1}{4}$ c.c. of this dilution—that is, taking 1 c.c. of the original preparation to contain 10 milligrams solid substance, $\frac{1}{1000}$ milligram solid substance. None of my cases have given any reaction to this dose. The injections are made generally twice a week. The seat of injection is the forearm or upper arm, as is most convenient. An injection is made into each arm alternately. If there is a marked reaction I generally wait a week before giving another injection. In some of the cases I have given three injections a week in the earlier part of the treatment—that is, of course, if there be no reaction; but, as a rule, two injections a week forms a very convenient plan. The injections are increased about 50 per cent. each time; that is to say, an injection of 1 c.c. would be followed by 1.5 c.c, and so on. If one is anxious to get the patient quickly under the influence of the remedy, there appears to be no objection to increasing the dose more rapidly in the earlier stages; but when one gets to the larger doses one has to proceed more cautiously. Nothing is gained by being in a hurry. The remedy takes time to act. On the whole, I think the plan of giving the injections twice a week, and increasing 50 per cent. each time, the best. If a reaction appears the next injection should be the same or smaller, always endeavouring to avoid a severe reaction. Moderate reactions seem to do no harm, but severe reactions are exhausting, and perhaps harmful. The usual hygienic means of treatment should, of course, not be neglected. I shall now give details of my cases:—

Case I.—Freddie H., aged 5 years, was admitted to hospital in February, 1907. His case has already been mentioned. The physical signs on admission suggested pressure by enlarged glands on the left bronchus. After the diagnosis of tuberculosis had been made he was taken by his mother to the country. He returned after about a month, rather worse, there being then marked dulness at the left base. He was kept in the hospital, made to sleep on the verandah, and fed up as much as possible. In spite of every attention, he became steadily worse, till in September the temperature used to rise every night to 103 degrees; there was well-marked tubular breathing over the dull area. I then undertook the tuberculine treatment. I commenced with $\frac{1}{4}$ c.c. of the 1 in 2,500 dilution of T.R. The injections were given only once a week; no determination of the opsonic index was made. It is no exaggeration to say that improvement set in with the first injection. The treatment was kept up for three months. At the end of that time he was discharged perfectly well. The chest had cleared up completely. As the result was so satisfactory, I did not think that it was necessary to continue the treatment any longer. He was seen again about fifteen months afterwards, and was still perfectly well.

Case II.—Gordon B——, age 10 years, was admitted to hospital in March, 1908, for suspected typhoid. He had a slightly raised temperature, which had given rise to the suspicion of typhoid. It soon became clear that he had not got typhoid. The temperature

having fallen to normal after a few days in hospital, he was discharged apparently well. He was readmitted shortly afterwards with a further rise in temperature; the diagnosis of tuberculosis naturally suggested itself, and he was given diagnostic injections of tuberculine; a positive reaction was obtained. The temperature being again normal, he was sent to the hospital Convalescent Home at Camden. He came back after a few weeks with a high temperature, and a large pleuritic effusion on the right side. The chest was aspirated, and tuberculine treatment immediately undertaken. I commenced with T.R., the same dose as in the previous case, but gave the injections twice a week. The result was quite as satisfactory, but treatment was much more prolonged. It was kept up for a period of about fifteen months altogether. The maximum dose reached was about 2 milligrams; latterly we used B.E., the maximum dose reached being $\frac{1}{4}$ milligram. He was much more sensitive to B.E. than to T.R. For about six months he was treated as an in-patient; for the rest of the time as an out-patient. The final result was completely satisfactory. I very much regret that I did not treat him with tuberculine immediately the diagnosis was made. These two cases occurring so soon after one another removed any lingering doubts in my mind as to the value of the treatment.

Case III.—Winifred B——, age 16 years, a sister of the foregoing, underwent the tuberculine treatment at the same time as her brother. The diagnosis was made by the tuberculine test, but I never succeeded in ascertaining the seat of the disease, in spite of repeated careful examinations. When first seen the temperature would rise every night to 103 or 104 degrees. Treatment with tuberculine was carried out on the same lines as in her brother's case, but as an out-patient. The first injection was given on 29th January, 1909, and thence on twice weekly. Although we found it difficult to enforce regular attendance, the ultimate result was satisfactory. When the treatment was finally discontinued at the end of October she appeared to have completely recovered.

Case IV.—Another case with pleuritic effusion, similar to case II. A child, 5 years of age, treated in the early part of 1909. I saw her father in March of this year, and he informed me that he had remained perfectly well ever since.

Case V.—A girl, aged 8 years, with tubercular peritonitis. Admitted to hospital for suspected typhoid. On admission there was a moderate elevation of temperature, with a tender spleen. She reacted to tuberculine. Treatment was then carried out on the lines of the other cases, with a completely satisfactory result. This was quite an early case, and the improvement under treatment was prompt and immediate. The injections were kept up for about three months; the treatment was then discontinued, partly because there seemed to be no necessity for it, and partly because we could not secure her regular attendance for the injections.

Case VI.—Donald M——, age 4 years, admitted to hospital, March, 1910, with what appeared to be a very severe attack of bronchitis. The child was very ill, with a high temperature, a very rapid respiration rate, between 70 and 80, and

a very distressing paroxysmal cough. An examination of the chest merely gave the physical signs of bronchitis. There was some cyanosis. A diagnosis of bronchitis with broncho-pneumonia was made. After a fortnight, as his condition did not materially improve, Von Pirquet's test was applied; it was negative. This was unfortunate, as it misled me. Another fortnight passed with but little improvement. I therefore decided to use the tuberculine test hypodermically, although the temperature had not become normal. A well-marked local reaction, with feelings of general malaise, resulted; and, although there was no typical rise in temperature, the reaction was quite characteristic. Treatment with T.R. tuberculine was then commenced on the usual plan, and maintained till December. The maximum dose reached was $2\frac{1}{2}$ milligrams. He was discharged at Christmas time in apparently perfect health. His temperature had long been normal, and he was plump and ruddy. Moist bronchitic signs were still present in the lungs on auscultation. After a month at home he was readmitted, as he had a troublesome cough. The physical signs were as before, and the temperature was normal. However, I thought it advisable, as the mother was a careless woman and not able to look after him properly, to give him another course of tuberculine treatment. On this occasion I maintained the treatment till the early part of June. We used T.R. at first, and later B.E. The injections were well borne, and we worked him up to about $1\frac{1}{4}$ milligrams, solid substance B.E. He was then discharged perfectly well, but with a few moist signs on his chest. Since then he has remained well.

Case VII.—Thomas J——, age 16 years. This boy was brought to me by his mother at the end of December, 1910. There was a history of cough for two and a half years, with very copious expectoration. He had ceased to grow, and had lost his appetite; the temperature every night would rise to 101 degrees. Open-air treatment had been carried out, and he had been sent to the country for prolonged periods without any benefit. On examination of the chest it was clear that there was a cavity in the right lung, not at the apex, but in the region of the scapula. The sputum was purulent, and contained tubercle bacilli in abundance. I recommended tuberculine treatment, the boy to remain at home and attend my rooms twice a week. In this case I used B.E. from the beginning, the initial dose being $\frac{1}{4}$ c.c. of a 1-2,500 dilution. The result has been most satisfactory. At the end of three months he had grown about 3 inches, his appetite was very good, the sputum had ceased to be purulent, was much less in quantity, and was mucoid. The temperature did not now rise above 99 degrees in the evening. I recommended another course of three months, the injections to be given once a week only. The maximum dose reached was 2 milligrams. At the end of the second course I sent him away to the country, where, as I am informed by his mother, he is enjoying himself immensely. His present condition is most satisfactory. Since the treatment was commenced he has gained 5 inches in height and about 10 lb. in weight. His only trouble is that mucus collects occasionally in the right lung, and has to be coughed up.

TREATMENT OF SURGICAL TUBERCULOSIS.

By MAX HERZ, M.D. (Mun.).

THE treatment of surgical tuberculosis has often, in past and our times, formed a theme for discussion. The frequency of this occurrence alone suggests that an answer, satisfying one and all, has not been found so far. The point of contention was and is: should the treatment be conservative or operative—shall the splint or the knife rule supreme? Different times have given different opinions, various men various views. Strong recommendation of operation was followed by sincere warning to leave well alone; the resecting knife was ousted by the preserving bandage. Thus Calot declares resection in cases of hip diseases to be not only superfluous, but a severe mistake, followed by grave and bitter consequences. In his countryman, Félizet's, opinion, however, the results of the conservative treatment of coxitis are extremely sad. Of eighty hip-disease patients, aged from 2 to 16 years, treated conservatively only nine survived their 20th year; whilst among 300 resected cases, only two deaths were counted. Other statistics, however—the figures of Alapy and Kocher, for instance—show that the percentage of mortality is almost alike in cases operated upon and treated conservatively—20 to 22 per cent. Of gonitis, Alapy's figures report a cure in 75 per cent. of conservatively-treated inflammation; Franz Koenig met cures only in 25 to 30 per cent. of his cases treated with splints; v. Bruns, on the other hand, reports failures of operative treatment in only 12 per cent.

One might go on quoting pages of figures, and would have to admit in the end, like Faust: "Da steh ich nun, ich armer Tor und bin so klug als wie zuvor!" ("And here, poor fool, with all my lore I stand no wiser than before!") The figures are interesting enough, but our question cannot be decided by them. This query—operative or conservative—is wrong from the outset, as both treatments are valid, and maintain their grounds. The answer can only be: conservative and operative. There is no room for doubt that tuberculosis, in all its forms, can heal without any treatment at all. The natural forces of the body may overcome the pernicious invader, cause the tuberculous granulations to shrink, to become fibrous and dry, and change into scar tissue, in which the tubercles perish or become enwalled, and with them any caseous foci. On this capability of the organism the question of conservative treatment hinges. The pity of it is that it is not in our hands to command it and bring this end about with regularity in all cases. And here the controversy begins.

There is a consensus of opinion regarding the treatment of bone-tuberculosis. The verdict is in favour of operative means; and rightly so. Where a focus has been discovered which is solely confined to the bone, its removal is indicated. This removal has to be of the most thorough nature; scraping alone is rarely sufficient. The operation has to end in healthy tissue; it must have as its aim to remove the diseased tissue, as if it were malignant. Only then quick and complete recovery can be relied upon. A union by first intention is a consummation devoutly to be wished for. And Mose-

tig gave us the means to this end with his iodoform bone-plugging plomb. Chisel, drill, cutters lay the focus open and free as far as necessary; everything diseased is taken away, the cavity in the bone being left smooth, clean, and dry. After it has been mopped out with 1 per cent. solution of formalin the plomb is poured in, and, after cooling, pressed tightly against the walls, the hollow thus being filled completely, leaving a surface flush with the bone. Were the surrounding tissues affected it is wise, after the removal of the diseased parts, to rub iodoform powder into the tissue. It is not so much the antiseptic virtues of the powder we rely upon; we set greater store on the constant irritation its presence produces on the tissues, calling into life healthy scar tissue, although there can be little doubt that its bactericide qualities will nip in the bud any attempted new formation of tubercles. The chief conditions for successful treatment of bone tuberculosis are these: absolute removal of all diseased parts, as if they were malignant, healing by first intention with the aid of iodoform and iodoform plomb.

Only one kind of bone tuberculosis we have to leave alone. Circumstances compel us to treat by conservative means the spondylitis, Pott's disease. But we may well quote the words of the "true apothecary": "My poverty, but not my will consents." The disease is inaccessible to the knife. The principles of the conservative treatment of Pott's disease are: Fixation of the spinal column in a manner which allows only the least possible movement and the least possible weight to press on the diseased parts, which promises a cure in the best possible position. Hand in hand with this goes the care for the patient's general condition. And for this we know besides good food no better agent than fresh air, no better stimulant than movement in the fresh air. These reasons make me a decided adversary to bed treatment of spondylitis. The extension on head and feet does not procure the best possible fixation; the little patient can wriggle, turn, and twist, and the lying position weakens him to a very great extent. More preferable by far is the ambulatory treatment in plaster of Paris and leather and steel jacket. To secure the best results it is incumbent to carry the plaster jacket from the hips to the neck; a high position of the disease can call for the inclusion of the head, the body being slightly extended. Calot's force is not recommendable, but one need not be too timid, as the power of extension exhausts itself mostly in the spinal parts adjoining the gibbus. If the progress has been favourable, the plaster jacket may be exchanged for a leather one, which has the advantage of being removable. To secure a good position at night time we know of no better and simpler device than Lorenz's plaster-bed. The principles of the surgical corset claim a construction different from the one usually applied by the instrument-maker. The chief mistakes committed by him are his ways of fixation on the body. The foundation of his body-splint is a ring running between the crista ilei and trochanter major; it needs but a short reflexion to be convinced that the halt is insufficient, as it is unstable; another error are the arm-crutches, which, screwed upwards, are intended to extend the spinal column. A superficial anatomical consideration will show that this is only an illusion. The real effect of these arm-

crutches consists only of an elevation of the clavicle and scapula, there being no traction on the spine. The best anatomical foundation for surgical body-splints is the crista ilei; and if an extended position is intended, the corset has to reach up to the chin and neck. If the spine has improved so that it can carry weight, the corset may end above the shoulder, giving the neck free; but in our opinion it should never be lower, and it forms another grave mistake of the corset in use here, that it is always too low, thus never securing the best possible fixation. The treatment in jackets allows the child to be brought into the fresh air, to run and play about, paddle in the sea, increase his appetite and vitality. It prevents spastic paralysis to supervene. And if this unfortunate event has occurred, the extension in a plaster jacket provides the best means to remove it, so long as the paralysis is caused by spinal oedema, which is the consequence of compression of blood, and lymphatic vessels by granulations and gibbus. If the destruction of the pyramidal tracts has become permanent, the only methods of relief are the opening of the spinal canal with the intent to remove pressure, or Foerster's operation.

The best treatment of cold abscesses is the puncture and injection of 10 per cent. iodoform glycerine emulsion. Should this prove a failure, one might resort to the application of trypsin. The cold abscess is discerned from the hot one by the lack or complete absence of a ferment able to dissolve albumen. Different authors have seen fair results by melting down granulation and pus, but it has to be borne in mind that these injections are painful, sometimes toxic, and that the dissolution of albumen does not always stop at diseased parts, but may melt down healthy tissue also.

On entering the grounds of joint tuberculosis, one steps on fields where many a verbal war has been waged, many a brave attack has been ridden, many big guns have thundered forth figures and statistics, and conclusion of peace seems as far off as ever. And yet, to one who has not sworn allegiance to one camp the whole fight seems unnecessary, as both parties are right. The question of treatment of tuberculous joints resolves itself into three queries: That of the patient's age, that of the character of the tuberculosis, and that of the surgeon's technique.

It is beyond doubt that the growing years impoverish the chances of healing; after the fifteenth year they are worse than before. For gonitis Kœnig reckons 52 per cent. cures with conservative treatment before fifteen years, and 22 per cent. after, so that the chances sink by more than half. There rises the question of the reasons of this strange barrier set by years. It is indeed remarkable that the juvenile joint is more liable to contract this disease, and on the other side offers distinctly better chances to become cured without the help of the knife. One can only suppose that the same cause underlies both conditions—i.e., the greater vascularisation of the growing bone; it offers more passages for the disease to spread, the embolus from an infected gland finds more ways and means to settle, and at the same time the curative powers in the blood, the anti-bodies, are carried quicker and in greater number to the scene of action than in an adult's bone with a smaller blood supply.

The character of the tuberculosis is of some weight when the decision of the treatment is in the balance. Fistulous joints, with acute suppuration or sepsis, patients who, besides the diseased joint, suffer from internal tuberculosis—lungs, kidneys—and people in a low general condition must not be submitted to conservative treatment. For them it is all-important to be freed from at least one source of their infection, so that the natural forces of the body, not over-taxed any more, have a fairer chance with the remaining foci. The surgeon's technique is another factor, to which we shall return later.

Generally speaking, the conservative, non-operative treatment should be tried in every fresh case of tuberculous joint disease. The question is: For how long? If it is followed by improvement it should be continued for years; if, on the other hand, the local disease progresses, or the general condition becomes worse, these are to be regarded as signs of the advance of the disease—i.e., of an extension of the infection into the bone and grave secondary involvement of the cartilage or bone. The resort, then, is the knife.

The aim of the conservative treatment is to cure with preservation of the joint apparatus, if possible in movable, if not possible, in the most favourable position. The therapeutic means to this end are: rest for the joint, rest as absolutely as we can procure it. No movement should be possible, no weight should press it. Fixation and cessation of weight-pressure must be procured. Extension of the joint is a third postulation often raised. It is, however, impossible to fulfil it, and constitutes a waste of energy. All the weights a patient can possibly bear on his limb will not suffice to separate the joint the least little bit. Sometimes the weights are attached to the underleg, below the knee, to secure some traction in the hip. How futile this is proves the consideration that all extension must needs exhaust itself in the knee, and never reaches the hip. The weight-extension acts merely as a steadier of the limb. The sole aim of conservative treatment, thus, is to secure fixation and cessation of pressure. With the methods usually applied here I regret to be at variance. Thomas's splint, the general remedy for gonitis and coxitis, takes the weight off the leg certainly; but it does not fix the limb in any way near enough to the necessity. It allows all the movements of the hip, with certain limitations, and does not give it that degree of rest which is essential and absolutely required. for it is well to remember that fixation is more important than the cessation of pressure. These reasons make me decline Thomas's splint, and replace it by a plaster of Paris bandage, with a stirrup underneath. A well-fitting bandage, closely moulded to the body, insures us of the best fixation, whilst the stirrup below the foot takes all the weight off the leg, transmitting it through the bandage to the tuber ischii. If the case be progressing favourably, and if, after a time, the joint be able to bear pressure and weight, the bandage can be shortened, thus fixing the joint only and taking a little weight off. The plaster of Paris bandage can be replaced conveniently by a splint made of leather and steel, which fixes the joint well, but not so securely as the plaster bandage.

Bier's congestion treatment, the use of tuberculine, have not brought about any material difference in the results. The pain disappears sometimes under Bier, but there is little doubt that the congestion favours the development of abscesses. Tuberculosis of the wrist is said to give the best results, affection of the knee the worst. The treatment cannot be applied to the hip.

Lorenz has lately recommended a treatment which, at first sight, seems no treatment at all. He noticed, like all of us, that if tuberculous joints heal, when left alone, they do so in contracted positions, and concluded that this contracted position favoured the cure, as being the natural and least irritating situation. There might be some grains of truth in the latter contention, but Lorenz's own statistics do not prove that his new method of fixing the joint in the contracted position, to be corrected afterwards, shows any advantage whatever over the older ones, which righted the contracture.

The correction of deformity will always claim attention. Slight contractures can be rectified under an anæsthetic; others might need two or three sessions. But I do not agree with any proposal of forceful manipulation in a tuberculous joint; this **brisement** forcé is liable to burst open old foci and restart old trouble, with sad consequences to the patient. The method of choice is the para-articular osteotomy. Although, perhaps, sometimes feared without reason, it is well to take it as law not to disturb a tuberculous joint which, to all appearances and signs, is healed. The place for the osteotomy, then, is near the joint. And the best way to correct the coxitic contracture, which is usually one of flexion and adduction, is the osteotomia subtrochanterica obliqua, a division of the bone in a direction from lateral and upwards to medial and downwards. Needless to say, weight-extension has to follow. This extension can be applied with the help of flannel bandages glued to the skin with Heusner's mixture, a method far superior to any strapping; but heavy weights have to be used, 25, 30, 40, even 50 lb., for the obliquity of the bone-cutting is intended to elongate the leg, and this can only be procured by a heavy pull. The new method of nail-extension has given us, as others, excellent results. A nail is driven above the condyls through the femur; a special apparatus attached to it allows the perusal of weights, which here need be only one-fourth to one-sixth of the amount necessary in the ordinary extension. For righting deformities of the knee, the double para-articular osteotomy, through femur, tibia, and fibula, close above and below the affected joint, is the most preferable method.

But what ought to be done to those cases of tuberculous joint diseases which are not suited to conservative treatment or show no improvement under it? Here the operative means enter; and I, for one, believe that they are not as black as they are painted to be. There can be little doubt that many a cure of tuberculosis arthritis is only a pseudo-cure. The process becomes dormant for a while, even for a year or two, to break out again with unabated vigour. The feeling of safety will not enter our mind, and the responsible gray matter of the surgeon carries always the picture of the sleeping lion. Many a cured "hip-disease" was not of a tuberculous character; for it is well to remember that the juvenile osteoarthritis coxæ

offers symptoms almost identical to tuberculous coxitis. An operation, performed *lege artis*, frees the surgeon's mind from many an anxious thought. The objections to resection are these: the shortening of the limb and the loss of growth, the contractures after the operation, fistulæ, and the recrudescence of the disease.

Certainly, it is a well-established fact that tuberculous joint disease is not a primary disease, is not a complaint which started and remained confined to the affected joint. The infection there is carried by way of the blood vessels in the shape of emboli, often originated from diseased lymphatic glands; but the infected joint easily becomes and remains the greater focus. The powers of the organism might well be able to defeat the small focus in the glands, but are overtaxed when called upon to tackle the overwhelming enemy in the joint. Look at a diseased knee-joint; the capsule is thickened, the synovial membrane riddled with tubercles, tuberculous granulations have covered the surfaces, penetrated, loosened, and dissolved large tracts of cartilage; the semi-lunar discs are one mass of tuberculous tissue, large fringes strewn with tubercles fill out every corner, parts of bone are softened and changed into sequesters by the granulations; in every niche, in every hollow, hovers the enemy. Look at it all, and then ask: Is the body not overtaxed in being asked to absorb this matter, or surround it with a wall of scar tissue through which nothing can escape? And more than once the answer must be that our expectations are too high, and cannot possibly be fulfilled. There remains, then, this question to be answered: Are the bad results reported, the shortening, lack of growth, the fistular formation and suppuration, are these necessarily the results of the operation itself, or are they not perhaps brought about by a faulty technique? One feels inclined to say that the so-called typical resection is the father of all the mischief. Our resection must be atypical. As in tuberculosis of the bone, the diseased tissue has to be removed as if it were malignant. The operation must end in the healthy tissue; everything sound must be saved, everything diseased must be eradicated, absolutely and thoroughly. Such undertaking cannot be done in a hurry; a resection takes time, as it wants infinite care and the minutest attention. The epiphyseal lines must be saved as much as possible. But to lead this operation of thoroughly eradicating every diseased particle to a successful end it is essential to have the best access to the joint. It is not our intention to weary you with a recount of all possible methods of opening joints, but we will content ourselves to mention those which in the past have given us the fullest satisfaction when operating on the three joints mainly affected by the white plague.

For the elbow we know of no better method than Kocher's. It saves all the main constituents of the joint, gives fullest and freest access, and so successful have been our operations, having gained always a good, movable joint, that we feel very much disposed, in future, not to waste much time with conservative means, which always spell stiff joint in the best possible position, but to resort to the knife very soon.

The knee is best opened by Volkmann's incision through the patella. It has been admitted by almost every author, that knee and elbow give better results after operative treatment than the hip. Why should that be so? Why this distinction, which is strange, as it is the same disease we have to deal with? The only reason which offers itself is that the hip joint, being situated so deeply, and therefore so badly accessible, offers not the good opportunity of removing all diseased tissue, as the other joints. Again a fault of technique. And yet, we have an incision which meets every requirement. And to any who ever used it once, it will be an ever-running source of wonder why it is not used more universally. This incision is known as Ollier's Snuff-Box Method. The joint is laid free by separating with the saw the trochanter and its muscles from the femur. And now the joint lies full exposed; anterior, posterior, above and below: all sides are open to the freest inspection when once the head is dislodged from its socket. By moving the femur, rotating, and abducting, every corner becomes accessible in the easiest manner, and our chief postulation for a successful treatment—the absolute removal of every bit of diseased tissue—can be carried out to the letter. It is impossible to praise Ollier's method too highly, impossible to recommend it too strongly.

Our primary postulation: the eradication of all tuberculous evil depends on a free and good access to the diseased joint, and we have incisions at our disposal which allow this. There is thus no difficulty that way. The secondary condition for a good end-result is: Healing by first intention. Here, again, Mosetig's Iodoform Plugging comes to our assistance. Every hole is to be filled, every fold to be covered with the paste or powder; no niche is to be forgotten, no empty space is allowed. The surgeon ought to have the horror vacui! The constitution of the paste permits only such a gradual absorption that fears of iodoform intoxication need not be entertained. The wound might then be either stitched up in its entirety or one or two drains inserted, to be removed after two or three days. A plaster of Paris bandage secures the position. The result to be wished and worked for now entirely depends on the state the joint was found and left in after the operation. Was it possible to save some of the joint constituents, some of the cartilages, or most of the condyle formation, early movements are indicated, and should be started not later than a fortnight after the operation. Was ankylosis the consummation, it might be necessary to secure the position with either silver nails, screws, or staples, or bone pegs in a way I shall describe in my paper on infantile paralysis.

My results with operative treatment of tuberculous joints have been very encouraging. And although it is far from me to recommend it in all cases, I think we are at the beginning of a time which will see greater activity in the operative treatment. It is not only of the greatest advantage to the patient's health to have all diseased tissue removed which forms a constant source of danger, but it is no small matter for his social position, if he can be freed of a disease in four weeks, which with other means takes as many years to cure. It would be only logical in this train of

thought to ask for operation in early cases, as they present for removal only a small quantity of diseased tissue, and show few or no destructions of the joint constituents, thus promising far better results. It seems odd to wait for an aggravation of the complaint. And, yet, at the present state of our diagnostic means, such a step will rarely be taken by anyone. One is scarcely justified to open up a joint which shows as symptoms only pain and a little limp. Perhaps we may expect assistance from the radiographer, who, it is hoped, will succeed in the near future in producing his photos so softly that we can discern healthy from unsound tissue before greater destruction has set in. At present we have to wait until the disease becomes more pronounced, until we recognise that our conservative means do not improve matters. Here the X-ray photo can enlighten us by revealing the actual state of affairs. It is not always easy to decide whether a tuberculous joint is progressing favourably or badly on the subjective system of pain, as everyone has met cases the only symptom of which was limping, where pain was never felt. Let us then hope that the future will give us the means to base, in all cases, our treatment on facts.

And so the end. I plead for both kinds of treatment, for conservative and operative, with a strong recommendation of the latter, executed according to modern technique.

DISCUSSION.

Dr. D. McM. OFFICER—Surgical treatment of tubercular hips was carried out extensively when he joined the service of the Melbourne Children's Hospital sixteen years ago, and after a thorough trial at the hands of such surgeons as Mr. Russell, was abandoned in favour of conservative methods, largely on account of the great amount of shortening which followed surgical methods.

Having succeeded to the out-patient clinique of Dr. Bennie, I have had ample opportunities of noting what great and lasting results can be gained by Thomas' splint treatment, efficiently carried out, as this clinique was largely composed of tubercular joints and spines.

I say "Thomas' splint treatment efficiently carried out," as I consider that nothing is more hopeless than Thomas' splint treatment where the splint is badly measured, fitted, or adjusted.

I have known residents come to the Children's Hospital for the sole purpose of becoming efficient in the measuring and fitting and careful adjustment, according to the ever-varying needs of the case. I think, judging from my own experience as a resident, that it will take from one to two years to acquire the knowledge necessary to make the treatment really efficient.

As a result of such treatment I can cite a case of Dr. Woods', who won the prize for club-swinging at the Women's Work Exhibition; a

case of my own, who is now earning his living as an electrician, continually running up and down ladders; another, a girl with tubercular knee, won a skipping competition; another, a spine case, who is now a miner in West Australia, and is well after twelve years of hard work. And one could go on indefinitely.

Our results with Thomas' splints are a lasting tribute to Dr. Bennie, who has some hundreds of records with angles of flexion and abduction carefully recorded by himself, many in the clinique to which I succeeded; and looking at these results one cannot but be impressed by the spinal cases which are inaccessible to the surgeon. These teach us what can be accomplished. Therefore, why attack joints surgically when one can obtain such results as those above quoted. True, the case must be seen early, and well known initial symptoms be accepted as warnings against delay. I would unhesitatingly reserve surgery for the treatment of abscesses, and then only by aspiration and filling with suitable antiseptic, such as sterile iodoform emulsion.

I consider that the plaster of paris splint, leather and steel, are each of them inferior to the Thomas' Splint treatment efficiently carried out.

Dr. GUY GRIFFITHS :—I am a strong advocate for conservatism; I think that operations should rarely be performed in late cases, never in early ones. Surgical tuberculosis in children differs from most other forms of the disease in being comparatively easy to recognise in the early stages, when with rest and progressive doses of tuberculin, as advocated by Dr. Wilkinson, success is reasonably certain. I have treated a number of cases, but not a great number, because the little patients are usually under the care of surgeons; and, again, because a number of those who were sent to me turned out not to have tuberculosis at all. They did not react to tuberculin; got well with simple treatment, and remained well.

The great danger to which children with surgical tuberculosis are liable is secondary infection; this sometimes occurs naturally; but often, unhappily, is the result of unwise surgical interference. Perhaps the worst possible treatment to apply to a tuberculous joint is to beat it with a pick-handle; to lay it open is nearly as bad. I firmly believe that twenty years hence physician and surgeon alike will be horror-stricken at the mere suggestion of opening a tuberculous joint.

Under treatment by complete rest and injections of tuberculin the results are splendid. Rest alone is much better than operation. Even in advanced cases, with mixed infection and discharging sinuses, I have seen excellent results from tuberculin after repeated operations had been performed in vain. Where the lymphatic and vascular supply of the affected part has been interfered with by surgical operation, it is much more difficult to get good results with tuberculin.

Four years ago I saw, with Dr. Wilkinson, a girl with tuberculosis of the wrist. The whole joint was disorganised; a bright red round mass, the size of a small mandarin projected on the posterior sur-

face; it fluctuated freely. I thought that immediate amputation was required, and was astounded when Dr. Wilkinson proposed to treat her with tuberculin. He did so, and the result was wonderfully good. Her hand was kept upon a splint for about two years; this was the only treatment she had besides tuberculin. The swelling completely disappeared, its site is now difficult to detect—the wrist is perfectly normal in appearance; the fingers are supple and strong; the movements at the wrists are limited, but there is a small amount of flexion in both directions, and of lateral flexion. However, the hand is perfectly useful, and she does with ease the heaviest work, including washing and scrubbing.

I have seen similar good results in tuberculosis of glands, kidney, bladder testis, middle ear, and larynx.

Dr. R. B. WADE.—The results of bone and joint tubercle cannot be said to be entirely satisfactory, although the actual death-rate is not large; still the functional results in the majority fall more or less short of normal. The unsatisfactory results are shown by the numerous methods of treatment. Recently, while travelling through the United States and England, I counted no less than eleven methods of treatment of tubercular hip only.

In tubercular hip the percentage of cases that recover with defective mobility is put down by many observers as from 70 to 80 per cent.; the results will obviously depend on early recognition of the disease and early treatment. Again, tubercle of the upper limb responds better to treatment than does that of the lower.

In the young, I think, the conservative method of treatment is generally accepted as giving the best results, while early radical operative measures are more indicated in the adult, where the disease is less amenable to treatment, and where business considerations demand a minimum loss of time to the patient.

The basis of all methods of treatment is undoubtedly rest, and those joints so constituted where it can be effectively obtained give better results than do those whose tendency to mobility is more difficult to overcome. This rest is best obtained by immobility, and the chief indication is not so much preventing pressure of affected surfaces together as is the friction of rotating affected surfaces on one another. The rest may be obtained by splints, plaster of paris or by the use of extension, used as fixation agents; for, after all, extension does its work, not by its pull and separation of the affected surfaces, but by acting as a strong fixing agent.

The question is still debatable between slow and rapid reduction; most schools are in favour of reduction slowly by means of extension and gradually allowing the weight of the limb to reduce little by little the angle of the deformity; the other, and, I think, the better, is the reduction under an anæsthetic and fixation of the limb in the corrected position. In cases where deformity is present and is merely fibrous or muscular, as, for instance, in a case of hip tubercle, where, as is so often seen, the deformity is of flexion and adduction, I always adopt it. Should there then be any tendency to

flexion recurrence, as shown by lordosis from flexion of the pelvis, the weight of the body is sufficient to soon act as a reducing agent; further, though it is said that the quick methods of reduction (forcible) opens up fresh channels, and increases the activity of the local trouble, and may aid in a general dissemination, personally I have never seen either of these occur, and think it may be neglected; and Jones, of Liverpool, who is a strong advocate of this method, tells me he has never seen any untoward result from it.

As regards, too, the general dissemination, I do not think it frequently occurs; and, apart from occasional cases of tubercular meningitis, we seldom see any metastasis to other organs, and it is a most uncommon thing to see the subjects of bone or joint tubercle attacked by lung tubercle. A case where the two co-exist is a curiosity, and then it is most probable that the one with bovine tubercle has been independently attacked with human. (I can recall but two cases where I have seen the two conditions co-existing.)

In putting up the affected joints, when immobilising them, one must consider, in the light of some probable ankylosis, what is the best position for subsequent use of the limb should it occur. These are roughly: For the shoulder, abduction to about 40 and slight rotation in; for the elbow, flexion through an angle of 135, hyperextension of the wrist; for the hip, if there is no shortening, a position of extension or of very slight flexion; if shortening is present, abduction to compensate for it, the angle of abduction varying according to the shortening, the ankle better at a right angle for the heel to take all the weight; knee, straight.

The more one treats any condition of abscess formation around a joint, the more one appreciates that the best results are gained by a highly conservative outlook. I do not now touch any abscess uncomplicated with other infection until it has reached the subcutaneous tissue, and then merely evacuate the pus and close again, reopening if it should fill up again. I find quite as good results are gained by this as by the injection into the cavity of iodoform or some similar substance; the lining-wall should not be curetted away, as it is merely a limiting membrane set there as a result of the disease to limit it and encompass its cure.

Many of these abscesses, we find, if left, will often disappear without opening; or, when opened, will be found to be shut off from the joint and bone.

If there are signs of septic infection superadded to the abscess, then, I think, they should be freely opened, any dead bone sought for and removed, and the cavity treated by drainage.

CONGENITAL HYPERTROPHIC PYLORIC STENOSIS.

By ALFRED AUSTIN LENDON, M.D. (Lond.)

(Consulting Surgeon to the Adelaide Children's Hospital; Clinical Lecturer on Diseases of Children, University of Adelaide).

W.B. was 6 weeks old, and he weighed 5 lb. 12 oz. on 23rd August, 1910, when he was admitted into the Adelaide Children's Hospital. For three weeks after his birth he was quite well, then he started vomiting everything; he was taken from the breast, as it was thought that the mother's milk was disagreeing with him, and fed on condensed milk; this he took all right for one day, and then recommenced vomiting. Horlick's malted milk was tried next, with the same result. On 20th August the child was brought to town, and Dr. Gunson was consulted, who recommended that he should be kept under observation at "Quambi" for a few days. His weight on admission there was 6 lb. 4 oz.; he was kept on wine whey, but the vomiting continued and he steadily lost in weight. His parents were healthy and had four other children, who were all healthy. Dr. Gunson suspected pyloric stenosis, and transferred the child to the hospital, where he invited me to operate upon him. I had no means of verifying the diagnosis, the credit of which is entirely due to Dr. Gunson. The father's permission to explore the abdomen was readily granted, as he was persuaded in his own mind that it was the only alternative. The operation was performed immediately after admission, the resident medical officers, Drs. Steele and Langley, assisting, the former with the anæsthesia. The abdomen was opened by an incision through the left rectus, and a finger introduced; the characteristic cartilaginous pylorus was immediately detected, and brought out through the wound. There was no difficulty about the performance of the posterior gastro-enterostomy, but the stomach, which was much distended, was accidentally pricked before it was opened during the stitching. There was considerable shock, but, thanks to the efficient nursing bestowed upon the case, the infant recovered. The temperature was raised above normal till 2nd September. The food for the first fortnight consisted of peptonised milk, and after that of undiluted, but citrated, cow's milk. A month after operation the infant had gained 3 lb., during the next month it put on 2 lb. more; on 3rd October it weighed 11 lb. 8 oz., just double his weight on admission.

REMARKS.

There have not been many papers on this subject by Australian writers, I contributed an article to the *Australasian Medical Gazette* for November, 1902, and this was followed by a letter from Dr. Flynn, of Sydney. Dr. Anstey Giles reported the first successful case of gastro-enterostomy two years later; four other cases of the disease have been reported in the *Intercolonial Medical Journal*, November, 1903, by Mackay, in the *Australasian Medical Gazette*, by Wade, 1909, and in the *Australian Medical Journal*, by Green, 1911. Dr. Newland has had two cases at the Adelaide Children's Hospital this year. I do not suppose for a moment that nine cases, of which five occurred in Adelaide, represent

all that have been observed in Australia, and one is curious to know why more, whether successful or fatal, have not been reported. Is the disease really so rare?

Now, what facts are to be collated from these papers? The first fact we learn is that all but one were boys. What can be the explanation of this fact? The children varied in family rank from the first-born to the fifth. They all appear to have been breast-fed at first. One only was thought to be a fortnight premature. The cardinal symptom, *the obstinate and forcible vomiting*, commenced at a variable date after birth. The earliest date was the fourteenth day, the latest the forty-first; the average was between three and four weeks. But there were indications of ill-health in some of the babies before this definite event. One appeared to have been constipated and flatulent from birth; another did not thrive from birth, and was said to have definite signs of syphilis; another lost weight from birth, and vomited occasionally; a fourth was restless, sleepless, fretful, and in pain for a couple of days. The other five children appeared to their mothers to be thriving till the vomiting actually set in. When the vomiting became regular, the wasting, if it had not previously been noticed, commenced and became progressive, the rate varying in five cases from an average of $\frac{1}{2}$ oz. to $3\frac{1}{2}$ oz. per diem; not always constipated before they commenced vomiting, the babies were invariably so afterwards, and obstinately so. Treatment prior to operation was directed naturally towards three objects: in (1) feeding the infant, (2) stopping the vomiting, (3) overcoming the constipation. With regard to feeding, it was assumed that the mother's milk was disagreeing, and so every conceivable substitute appears to have been tried, natural and artificial; the list, nearly as long as the catalogue of the Homeric fleet, need scarcely be given in detail. To check the sickness many of the usual drugs were employed, and in three cases lavage of the stomach was adopted. There was no great difficulty in overcoming the constipation with enemata.

With respect to the vomiting, which I have described as the cardinal symptom, a word or two more is necessary. It was often preceded, so onlookers judged, by pain, and the pain was thought to be immediately relieved when the stomach was empty. Then soon after the ravenous appetite seemed to return and the same vicious circle was followed. The vomited material is described as milk, little altered in appearance, "curdled and sour smelling," a very large quantity of "watery fluid, mucus, and curds," of slightly acid smell and acid reaction. To me the great point is the absence of bile from the vomit, indicating that the obstruction is sufficiently great to prohibit regurgitation of the duodenal contents into the stomach. The manner in which the contents of the stomach are pumped up is graphically described: it is "ejected with surprising force and suddenness, gushing forth like water from a pump;" there is vomiting of "projectile type," the vomit "being jerked feet away from the mouth, and occasionally through the nose."

As regards the abdomen, in no case is there any mention of the pyloric lump being felt, in four cases the peristaltic waves were observed, in one case the abdomen was described as being pear-shaped, and in two others as being distended in the upper zone and contracted in the lower.

There was never any fever apparently, though sometimes the pulse rate was rapid. Eight cases were operated upon, and one recovered without operation.

In my first case a Loreta's operation gave temporary relief, and a second exploration was performed six weeks later. In one other case the same operation was performed, but the patient succumbed immediately. The remaining six were submitted to an ordinary posterior gastro-enterostomy, and of these two have survived, and are respectively now 7 years and 1 year of age. Of the others one survived five weeks, another ten days, but two succumbed within a few hours. The successful result in Dr. Giles', and in my own case, cannot be attributed merely to an early operation. In his case the child was operated upon when $7\frac{1}{2}$ weeks old, and on the thirteenth day after the first sign of there being anything wrong with him; in my case the child was 6 weeks, and had been vomiting for three weeks. Other cases were operated upon just as early, or even earlier than this, after the first symptom, and by surgeons of experience.

Is there any explanation as regards the failures? Well, in the first place, I am of opinion that Loreta's operation is not the most suitable. Pioneers in any branch of surgery are apt to make mistakes. When I encountered my first case I could not find any references to the subject, but I had a hazy notion that I had seen in the *Intercolonial Medical Journal* a notice of a case of Nicholl's, of Glasgow, where Loreta's operation had been successfully performed. I dilated the pylorus as much as I thought I safely could, but the relief was only for a few weeks. I have no doubt now that, had I performed gastro-enterostomy, the result would have been a success. McKay, dissatisfied with the result of gastro-enterostomy in his first case, tried a Loreta's operation, and the result was death from exhaustion twenty-two hours later. Then as regards the cause of death in the four cases of unsuccessful gastro-enterostomy: one death must be assigned to shock, another infant succumbed to vomiting thirty-six hours after operation, and it was found post-mortem that the re-duplicated folds of mucous membrane blocked the artificial opening; the other deaths were attributed to broncho-pneumonia and to diarrhoea respectively. In Dr. Green's case of recovery careful diet and lavage were the main features of the treatment. So much for the facts gleaned from the cases reported in Australia.

Going further afield we find that there are rather larger statistics afforded by the reporters to the Toulouse Congress of last year (1910). It is stated to be a disease preferentially affecting Anglo-Saxon races; that the males affected are as five to one female; that in one-fifth of the cases the vomiting sets in as early as the fourth day; the authors favour the idea of congenital malformation; they mention apparent cures under medical treatment and yet persistence of the pyloric condition after death from other causes; they report that the mortality after gastro-enterostomy is 33 per cent., but after pyloroplasty 50 per cent. In October, 1910, a lecture was given on this subject by Dr. Hutchison, whose clinical description of the disease accords with all the others I have read, in fact all cases seem perfectly alike. Dr. Hutchison breaks away in some directions: he does not like the title; he admits the pylorus

to be the seat of the complaint and stenosis the feature of it, but he disputes its congenital occurrence and its hypertrophic nature; he gets striking results by medical treatment, and thinks that "in practice" operation is *never* to be recommended. The chief points, therefore, open to debate to-day seems to me to be these:—

- (1) Is the disease really congenital?
- (2) What is its nature? Is it a genuine muscular hypertrophy, or is it a malformation?
- (3) Can the disease possibly be cured by medical treatment, or should we operate as soon as we are reasonably sure of our diagnosis?

(1) Is the disease congenital?

I show here a specimen of the disease. As I have elsewhere described it, the tumour looks like a miniature cervix uteri projecting into the lumen of the bowel. There was no appreciable difference between this specimen when I operated upon it six weeks after birth and when it was removed six weeks later. Nor was there any appreciable difference between this specimen and the pyloric lump handled in my successful case. If it be not congenital (and I believe no case has been recorded at an autopsy on a still-born child) then we are to believe that a lump of this cartilaginous consistence can develop in six weeks and not alter in another six weeks. To me it is incredible. We have statistical evidence that in one-fifth of the cases the symptoms appear on the fourth day; probably they are started by congestion or oedema of the mucous membrane of the pars pylorica of the stomach, which is here seen in thickened and exaggerated folds.

(2) What is its nature?

It seems generally agreed that the pyloric thickening is due to an enormous development of circular muscular fibres; it is not inflammatory. Is it an hypertrophy, or is it a congenital malformation? The theory that it may be an hypertrophy due to spasm seems to me puerile; if one may apply such an epithet to a view seriously suggested or entertained by distinguished writers. The best view I have seen advanced came from Sydney. Commenting on my original paper in 1902, Dr. Flynn suggests the probability of its being a reversion to the type of pylorus seen in members of the edentate order, such as the great ant-eater. Although lamentably ignorant as regards zoology, this theory appeals to one who has always suggested that congenital talipes is a reversion in type to our arboreal ancestors. Thus far had I written, when, in a paper in the *British Medical Journal*, Sir Jas. Barr seemed to settle the question once and for all; the condition is due to an excessive amount of calcium in the stomach walls. He mildly ridicules the physicians and surgeons who have overlooked this "simple explanation";—one wonders whether there can be a condition of too much calcium on the brain.

(3) The treatment.

Far more important is the question of treatment. Can these cases be cured by careful dieting and by lavage? Hutchison says yes, but adds the singular qualification that cases do better in private than in hospital

practice. He cured seventeen cases out of seventeen treated at home; and quotes similar statistics. In the (Great Ormond street?) Children's Hospital medical treatment was followed by a mortality of nearly four out of every five in a series of sixty-four cases; he suggests that they became "hospitalised," and I think there may be something in this suggestion. Acting upon it, I kept my successful case as far as possible away from other children, and mostly in the open air.

As the medical treatment in hospital results in a death rate of nearly 80 per cent., and as the death rate of gastro-enterostomy in the series of cases "reported" to the Toulouse Congress was 33 per cent., the correct treatment of hospital cases is clear. Could we be sure of our diagnosis earlier the death rate might soon sink to that, for instance, of intussusception in the able hands of our friend Dr. Clubbe.

If, however, Dr. Hutchison can get 100 per cent. recoveries in private practice, are we ever justified in operating? Again, we must assume that the cases Dr. Hutchison cures are really of this nature, nor is it necessary to impute an error in diagnosis in the case of such a distinguished clinician.

What happens when the patient grows up? Does the stenosis disappear? Has it ever been found persisting in the adult?

I confess to being somewhat puzzled, but it is difficult to persuade me that the cases I have seen would have survived had they not been operated upon.

DISCUSSION.

Dr. T. E. GREEN thought that a number of cases of this disease passed unrecognised in the hurry and bustle of lodge practice, being placed in the category of the favourite lay expression "**marasmus**."

The symptoms were unmistakable. Any breast-fed infant commencing to vomit in the second or third week—particularly if the vomiting is projectile in type—should be regarded with suspicion, and a systematic examination should be made—the presence of a peristaltic wave practically clinching the diagnosis.

The pathology of the condition was very obscure, and it was almost certain that the two factors of organic hypertrophy and spasm varied very much in individual cases.

He had recently under his care a case which, after six months hard work, repaid the anxiety and worry by getting well. The child weighed over 9 lb. shortly after birth, and commenced to vomit about seventeenth day. The vomiting increased in severity and was markedly projectile in type, the stomach contents sometimes being ejected feet from the mouth. Peristalsis of the stomach was very evident, but no tumour

could be felt. In this case a feature was the almost complete absence of hydrochloric acid in a free state—in several examinations, although the reaction was markedly acid, due to the presence of lactic and butyric acids, which were proved present in a laboratory examination of the decanted contents.

Acetone was only detected in one sample of urine, although, by the watchfulness of the nurse, several specimens were obtained and carefully examined.

In the case quoted the weight fell to below 8 lb., and at $4\frac{1}{2}$ months was less than what it was when the baby was 10 days old. Subsequently to that rapid improvement occurred, and at $6\frac{1}{2}$ months the weight was 18 lb.

The success in this case was due to lavage—twice daily, with the help of medicine, given by the mouth, containing mag. carb. and tr. opii. in gradually increasing doses up to m. $\frac{1}{4}$ before feeding, the interval of which was gradually lengthened to three hours.

Plasmon whey and peptonised milk formed the staple diet after the breast-milk disappeared, and the rectum also absorbed nutriment enemata well for months. When, owing to temporary irritability, it could not be used, the child at once became restless and irritable—apparently on account of missing the fluid.

The quantity of stomach content varied, as much as $5\frac{1}{2}$ to 6 ounces of fluid being decanted off on occasion.

Personally he thought that in the majority of cases the outlook was better under careful medical supervision, with strict attention to detail in lavage and opium dosage, than under surgical measures.

Dr. P. L. HIPSLEY:—The subject of congenital hypertrophic stenosis of the pylorus has excited a good deal of attention in recent years. The symptoms are well known, and there is no need to recapitulate them, but there is a difference of opinion with regard to the etiology of the condition. Many theories have been advanced to explain this peculiar disease, but all of them can be condensed into two:—

I.—Congenital malformation theory.—Those who support this theory maintain that the infants who suffer from this disease, are born into the world with the so-called hypertrophy of the pylorus; in other words the condition is a congenital anomaly.

II.—The hypertrophy is the result of repeated spasm, due either to an irritant in the stomach or else to inco-ordination of the nervous arrangement of the stomach leading to antagonistic action of its musculature. In my opinion the weight of evidence is in favour of the congenital anomaly theory, and I base this assumption on the following grounds:—

- (1) The condition always occurs in very young infants, and the symptoms are well marked in the first ten days of life. It never by any chance develops later. Now, it is reasonable to assume that the cause of symptoms which are invariably well marked from four to ten days after birth existed at birth.

- (2) In children dying soon after the symptoms are noticed, either as the result of an operation or from some other cause, it is found that there is considerable hypertrophy present, too much to have been produced in a few weeks.
- (3) Infants suffering from this complaint are invariably emaciated, and are not fit subjects for hypertrophy anywhere.
- (4) The stomach as a rule is not dilated in the early stages. Now, if stenosis from spasm was the primary condition one would expect first of all dilatation and then hypertrophy later, as a compensatory condition. In three cases which came under my notice, although markedly emaciated, there was very little dilatation present :—

Ex. I.—Child, age 4 weeks. Had the classical symptoms, and lump could easily be felt. Died thirteen days after a Loreta's operation. Capacity of stomach, 4 oz.

Ex. II.—Child, age 5 weeks. Died twenty-four hours after a gastro-duodenostomy operation. P.-M.—No marked dilatation.

Ex. III.—Child, age 4 weeks. Also died after operation. P.-M.—Capacity of stomach only 2 oz.

Of course, where death is delayed for several months dilatation may be a marked feature, as the following two cases show :—

Ex. I.—Death at three months, when infant weighed only 5 lb. 12½ oz. P.-M.—Stomach reached almost to the pubis. (See Plate I.)

Ex. II.—Death at three months. P.-M.—Stomach also found to be markedly dilated, although actual capacity was not estimated.

The stomach, however, is not always dilated, even where death is delayed as long as three months. Three cases reported by Still in the transactions of the Pathological Society of London, 1899, illustrate this fact :—

Ex. I.—Child, age 12½ weeks at death. Size of stomach was said to be not obviously larger than normal.

Ex. II.—Child, age 14 weeks at death. Stomach very slightly dilated.

Ex. III.—Child, age 14 weeks at death. Stomach little, if at all, dilated.

In these cases I presume that the stenosis was not great, even though the thickening of the pylorus may have been considerable.

- (5) There is no other example in the body of a sphincter undergoing similar hypertrophy, nor does the circular muscular coat of the bowel hypertrophy in a similar manner, even although there may be repeated spasm from the presence of an ulcer, polypus, or chronic intussusception.

- (6) If the stomachs of children dying from different causes be carefully and systematically examined, one comes across many congenital anomalies which could be classed in the same category as congenital hypertrophic stenosis of the pylorus, but differing from it in the degree of thickness of the pylorus and the amount of obstruction present. Out of 100 post-mortems done on infants under 12 months, where the thickness of the pylorus was noticed, about half a dozen presented fairly marked thickening of the region of the stomach. The following is an example of such a case:—

Child, age 7 months. Admitted to hospital for vomiting and diarrhoea. Had been breast-fed for two weeks, then put on bottle-feeding. The baby never thrived, and on admission to hospital only weighed 8 lb. Death was attributed to gastro-enteritis.

P.-M.—The capacity of stomach was estimated and found to be only $2\frac{3}{4}$ oz.

The organ presented peculiar features and showed two constrictions, one about the junction of cardiac and pyloric segments, and one about midway between this one and the pyloric opening. The whole stomach wall was very much thickened, especially the pylorus. The wall of the pylorus was 3.5 mm. thick.

Now, death in this case was attributed to gastro-enteritis, but there is no doubt that the condition of the stomach caused the extreme wasting which preceded the final attack of gastro-enteritis.

- (7) Microscopically we find that the condition is not a simple hypertrophy of the pylorus. The principal features seen under the microscope are, first, thickening of the longitudinal muscular layer and increase of the fibrous tissue element, and secondly, a great increase in the thickness of the circular muscular layer. Interspersed, however, between these circular muscular fibres there are bundles of muscular fibres running in different directions; some of them come from the longitudinal layer, and run for variable distances through the circular fibres, many of them extending as far as the submucosa.
- (8) Dr. Flynn has pointed out the resemblances which these stomachs bear to the stomachs of certain edentate mammals like the great ant-eater and certain armadillos. The portion which is thickened corresponds to the gastric mill of the insecta and crustacea, and to the gizzard of birds. He, therefore, maintains that congenital hypertrophic stenosis of the pylorus is really a reversion to the type of stomach found in these animals, and is, therefore, necessarily congenital. This certainly seems to me to be the correct explanation of the condition.
- (9) The fact that many, possibly the majority, of cases can be cured by medical means alone, favours the congenital theory. We find that the best treatment is to give the infant very small

quantities of the **most** easily-digested food available, and give it at frequent intervals. The **mother's** milk first, and if this is not available, the next best substitute in the way of **modified** milk. The point of **importance** is to give it in such small quantities that one meal can be dealt with and passed on through the narrowed pylorus before the next one is given. The infant **remains** in a very **emaciated** condition for several **months**, and then rather suddenly takes a turn for the better, and begins to put on weight rapidly. Such a process of recovery is to my mind **more** compatible with the view that the **stomach** is gradually developing into the normal condition than that a **spasmodic** condition of the sphincter is gradually yielding to **treatment**. The consensus of opinion seems to be that drugs are of very little value in **treatment**. At any rate cases do well without them, which fact would not hold if **spasm** were the principal feature.

Now, the only real objection to the congenital theory is that **symptoms** do not usually become prominent until about 7-10 days after birth. I think, however, that this fact can be easily explained. First of all, infants take little or no nourishment for the first few days of life. The very small meals taken during the next few days might easily be passed through the thickened pylorus, especially as stenosis is not always a marked feature of these cases in the early stages. Loss of weight is looked upon as a normal state of affairs for the first week of life, and, therefore, would not excite **much** attention. Moreover, vomiting during the first few days would not be considered anything unusual. The infant does not require **much** nourishment during the first week, and it is able to get sufficient to supply the needs of the body from the small **amount** which can pass through the pylorus. As the infant gets older, however, and the requirements of the body become greater, then **more** food is taken into the **stomach** than that organ can deal with, and the characteristic vomiting then begins, and once established persists until suitable **treatment** is commenced. I believe, also, that symptoms do begin even in the first few days of life, but are so slight that not **much** notice is taken of them until the characteristic forcible vomiting begins.

Dr. R. B. WADE:—Cases of pyloric stenosis are but infrequently seen, and though three cases, which is the number I have had under my care, may seem but few to draw any conclusions from, still I am tempted to do so, as it is a number in excess of what falls to the lot of most of us.

Of these three cases, one was moribund when first seen, in the other two a posterior gastro-enterostomy was done after medical measures had failed. One of these died five weeks after the operation from an intercurrent attack of enteritis, after having put on about a pound in weight; the other, done eighteen months ago, is well, and when last seen had had no further gastric symptoms, and had thrived well.

Probably the condition is more common than is generally estimated, and some at least of those babies dying in the first few months of life from wasting troubles have in all likelihood been affected with this condition. The striking feature in this condition is the visible peristalsis; but it is not constantly present, and one may examine the child in a free interval and so overlook it. I have found it may at times be elicited by giving the child a drink, or one may find it on examining immediately after the stomach has been washed out. In none of the cases was I able to palpate the pyloric lump, and in the case of the two who were operated upon it could not be felt even under anæsthetic. Symptoms well recognised by the parents are the diminution in both urine and fæces (one of my cases was referred to me as needing circumcision on account of difficulty of urination). Radiographs after a bismuth meal would, I think, always be of value in gastric disability in babies, and would allow of early recognition of the pyloric block.

Statistics at present give very divergent results, some claiming recoveries from 70 to 80 per cent. from medical treatment; others, results almost constantly bad from the same methods. An average taken of all the results that can be got in the literature shows 50 per cent. recoveries from 184 cases treated medically, and 62 per cent. in 91 cases treated surgically. A closer analysis of these will show the results are not fair to surgical methods, as many of the medical cases that are not doing well are transferred to the surgeon, whereas if the medical treatment were continued with they would probably die, and so raise the mortality from that form of treatment. Again, those treated surgically have always had a previous unsuccessful course at the physician's hands, and are only sent on to the surgeon as a last resource, and when they are in a most unsuitable condition for any operative procedures.

Personally, though granting that some of the cases would recover by medical methods, I should in any future case not waste time, but immediately proceed to operative treatment; and I think that as operative measures come to be used early that our percentage of cures will correspondingly increase.

Another point, that as the spasm of the pyloric sphincter is the offending agent, there is no need to take the baby off the breast and try frequent changes of food, since we have no proof that the food is the cause of the spasm, and, in fact, it is unlikely in these cases that the breast milk should do so, and yet this is the treatment usually adopted. If, then, we make our diagnosis early, keep the child on the breast and operate early, we will have all the factors that will ensure satisfactory results.

Some interesting results have been published by Huebner, Bernheim, and Karrer of the late results in children who have been treated medically and recovered, which show that marked gastric disability, though not enough to place life in danger, has persisted for years.

Three main forms of surgical procedure have been used—pyloroplasty, divulsion, and gastro-enterostomy. Of these, the former does not appeal to me as a suitable method when one considers the

thick mass of tissue at the site of the operation, and the results have not been good, if we except those of Nicholls, who first practised the method. The number of recurrences after Loreta's operation have, I believe, induced those who advocated it—as, for instance, Stiles of Edinburgh—to give it up in favour of gastro-enterostomy. This latter appears to me to be the operation of choice, preferably a posterior, if the condition of the child warrants it.

A gastro-enterostomy may be by no means a simple performance in every young baby when the jejunum is empty and contracted; in one of my cases it was not thicker than a lead-pencil during the time of handling.

Cases have been reported where the abdominal wound has given way and prolapse of the gut taken place, and I think there is always in a young baby a relatively greater intra-abdominal pressure (weaker muscles less able to resist it than in those older). The incision I used in my last case was a transverse one, with separation of the recti after opening into the sheaths; this gives ample room, and only leaves one small weak spot in the centre during the process of healing.

INFECTIONS OF THE URINARY TRACT IN CHILDREN BY THE BACILLUS COLI COMMUNIS.

By E. S. LITTLEJOHN, M.D.

It is only comparatively recently that infection of the urinary tract by the bacillus coli communis has attracted much attention, though it is undoubtedly of frequent occurrence.

The first paper on the subject appeared in 1894, and the first form of the condition to receive notice was coli-cystitis. Subsequently it was recognised that pyelitis and pyelo-nephritis were also sometimes due to the same infection. The condition is without doubt quite a common one in children, but has frequently escaped recognition.

It is stated by Pardoe and others that it is much less frequent in children than in adults, owing chiefly to the fact that children are not so liable to certain conditions of the urinary tract which act strongly as predisposing factors, such as stricture of the urethra, enlargement of the prostate, calenli, gonorrhœa, intestinal-mucous lesions and (in women) pregnancy. All of these conditions give rise to more or less obstruction to the flow of urine, and cause an injurious backward pressure which strongly predisposes to bacterial invasion.

There is no doubt that this is true with regard to secondary infection, which is the rule in adults, but in children the infection is usually primary,

autogenous, and uncomplicated, the cases in which it is secondary to other urinary affections being exceptional. Hence, in children, it frequently presents no local symptoms whatever to draw attention to the urinary tract, and unless the condition is constantly kept in mind, its presence is apt to be overlooked.

In a series of 418 consecutive cases admitted to hospital, there were 15 cases of bacillus coli infection of the urinary tract, giving a percentage of 3.59.

Ætiology.

1. *Age*.—It occurs at all ages, and is common among infants and young children. Lebia states that it is most frequent in the first 18 months of life, and I think in all probability it is not of infrequent occurrence in cases of gastro-enteritis in infants, though in my cases there were no infants, the ages ranging between 4 and 13 years.

2. *Sex*.—Almost all observers are unanimous that it is much more frequent among females than among males.

Morse, in 50 cases, found 30 females and 20 males; Abt, in 22 cases, found only 1 male; and other observers have found the proportion to be 17 females to 1 male, 10 to 0, and 7 to 0. In a recent series collected by Jeffreys the proportion was 53 females to 7 males.

In my own cases the proportion was 11 females to 4 males.

3. *Previous illnesses* certainly appear to be a predisposing factor, by lowering the resistance to bacterial invasion. I have found it following shortly after scarlatina, nephritis, rheumatic endocarditis, pneumonia, and diphtheria, in two cases in each instance. It is apt to occur also in the course of these acute infections, such as diphtheria, measles, and scarlatina.

4. *Intestinal disorders* also undoubtedly favour infection, especially constipation. John Thomson found that 12 out of 25 cases suffered from habitual constipation; other observers state that constipation is always present.

Thrupp found the bacilli present in the urine of 14 out of 17 infants suffering from intestinal disorders, and Jeffreys found that 34 out of 60 cases were associated with gastro-intestinal affections.

5. *Affections of the urinary tract*.—In exceptional cases, in children, it is secondary to urinary calculus and to phimosis.

Graham Forbes reports a case in a boy of 5½ months, who died of the condition 4 days after a circumcision for phimosis, the urine containing much pus and many bacilli. Post-mortem both kidneys were found purple and nodular, the ureters much dilated, and the bladder hypertrophied. Occasionally, also, as suggested by Box, the entrance of thread-worms into the urethra in females may give rise to an ascending infection.

Mode of Infection.

There are three possible modes of infection:—

1. Ascending infection;
2. Transparietal infection; and
3. Hæmatogenous infection.

1. *Ascending infection*.—In this form the infection spreads upwards from the urethra to the bladder, and thence in some cases to the ureter and pelvis of the kidney.

It is obvious how readily infection might reach the urethra in young children from soiled diapers, especially in females; the short urethra in the latter, also, affording little protection to the bladder. Hence the greater frequency of the condition in females.

The bacillus coli communis has been found present in the vagina and on the vulva of many females, and on the prepuce of many males.

Pardoe records three cases in which the disease began as an acute urethritis, and in many cases it begins as a cystitis, with increased frequency of micturition, pain on micturition, and pain in the hypogastrium. Also, in females, the cystitis is often associated with vulvitis and vulvo-vaginitis. Moreover, the cases in which there is a pyelitis without any cystitis, may be due to an ascending infection. For it has been shown that organisms may pass along mucous channels without setting up any inflammatory changes in their passage.

Probably an ascending infection is of frequent occurrence in young children.

2. *Transparietal infection*.—In this form the organisms pass directly from the colon to the kidney or bladder, probably by the lymphatics. In these cases no doubt the mucous membrane of the colon must be injured by inflammation or constipation to allow the bacilli to pass through.

The frequent association of the condition with intestinal inflammations and with constipation has been pointed out by many observers. A fatal case is recorded by Jeffreys in which pus was found in the renal pelvis and ureter on each side, and inflamed patches in the colon at the hepatic and splenic flexures.

However, in the pyelitis cases all observers have noted that the right kidney is far more frequently affected than the left, and Jeffreys points out that this is due to the close anatomical association between the right kidney and the ascending colon, cæcum, and appendix, the direct passage of the bacilli from the colon to the kidney being facilitated by the ulceration frequently found to be present in the ascending colon and cæcum in cases of chronic fæcal obstruction. Moreover, the lower position of the right kidney renders it more liable to injury, which would predispose it to infection.

All the evidence on the subject points strongly to transparietal infection being also of frequent occurrence.

3. *Hæmatogenous infection*.—That a hæmatogenous infection is possible has been proved by Posnet and Lewis, who showed that by simultaneous mechanical occlusion of the anus and urethra, a general infection can be produced, and that the organisms are then found in the urine. That the infection was not due, in these cases, to direct extension from the bowel to the bladder and kidneys, but took place through the blood-stream, was proved by the fact that if one renal artery were also ligatured, the corresponding kidney did not show any infection.

In a few cases the bacillus coli has been isolated from the blood, and the presumption is that it entered it through some damaged area of mucous membrane in the bowel, hence in these cases direct transparietal infection is not excluded. The fact also that in pyelitis cases only one kidney is as a rule involved, is against hæmatogenous infection as being at all frequent. Hæmatogenous infection is probably of rare occurrence, the usual routes being either ascending or transparietal.

Those cases which have been reported as following a circumcision, or in which the presence of fissures about the anus has afforded a portal of entry, may be regarded as hæmatogenous.

Sites of the Infective Process.

Any part of the urinary tract may be involved, resulting in urethritis, prostatitis, cystitis, ureteritis, pyelitis pyelo-nephritis, or nephritis. These parts may each be the seat of infection separately, or the whole urinary tract may be involved.

In older children cystitis is by far the commonest form of the diseases. In young children—and the younger the child the more likely is this to be the case—pyelitis, and pyelo-nephritis. In females the cystitis is often associated with vulvitis and vulvo-vaginitis.

In infants, the affection is almost always a pyelo-nephritis.

Rarely both kidneys are the seat of the disease, but as a rule, only one is affected, and in the great majority of cases it is the right kidney. In Jeffreys' cases, in those in which only one kidney was affected, it was the right in twelve out of fifteen.

The reasons for this frequent involvement of the right kidney, are, as has already been stated, the close anatomical relation of the right kidney with the ascending colon, and its lower position.

In my fifteen cases, there were symptoms referable to the bladder in seven, and renal casts in one.

Morbid Anatomy.

A considerable number of post-mortem examinations has now been made, and the morbid appearances are well recognised.

In severe cases of pyelitis and pyelo-nephritis, the kidney is the seat of multiple abscesses. In the less severe forms it is enlarged, sometimes to double its size, with intense congestion and dilatation of the sub-capsular veins, and sometimes sub-capsular hæmorrhage.

There are also catarrhal changes, œdematous swelling, and congestion of the mucous membrane of the pelvis of the kidney, with sub-mucous hæmorrhage. The inflammation is sometimes confined to the kidney and sometimes extends into the ureter, causing obstruction and consequent pain and swelling in the kidney.

Microscopically, the kidney shows cloudy swelling and small-celled infiltration in the milder cases, and multiple foci of suppuration in the severe ones.

In a case recorded by Abt, in a girl of 13 months, cystoscopic examination showed the bladder to be normal, with pus exuding from both ureters. In another, in an infant 6 weeks old, the kidney was found post-mortem to contain pus and to be the seat of miliary abscesses.

Jeffrey reports two cases in which there was double pyelitis, and both ureters were dilated and tortuous, and the bladder hypertrophied.

In a fatal case recorded by Box, there were widespread changes in the urinary passages. The right kidney was shrunken and its pelvis dilated; the left was swollen, mottled, very coarsely granular, and partly hydro-nephrotic. The ureters were dilated and thickened, and the bladder hypertrophied from chronic cystitis. There was no obstruction in the urinary passages.

Box suggests that these infections may be the cause of certain obscure cases of hypertrophy and dilatation of the urinary bladder and ureters, in the absence of obstruction, and also of certain cases of hydro-nephrosis and renal atrophy.

Clinical Types of the Infection.

There are several quite distinct clinical types of the condition met with, the symptoms presenting a wide range of diversity, not merely dependent on the site or acuteness of the infection.

These types may be classified as follows :—

1. Simple bacilluria, without symptoms.
2. Cases with subacute constitutional symptoms, resembling a mild attack of typhoid.
3. Acute infection with marked local symptoms referable to the bladder or kidney.
4. Cases with acute abdominal symptoms resembling “acute abdomen.”
5. Acute infections with severe constitutional symptoms, local symptoms being latent.
6. Acute “cerebral” cases.
7. Chronic and persistent infections.
8. Secondary cases, e.g., secondary to calculus.

Symptoms.

These present a wide range of diversity, according to the type of the affection.

1. *Simple bacilluria*.—In this form there are few or no symptoms, and the condition is often discovered unexpectedly in the routine examination of the urine. Nevertheless it is a matter of considerable importance that it should be discovered and treated, as several cases have been reported which ultimately ended fatally in uræmia.

There is often some malaise, anæmia, mal-nutrition; and a tired apathetical expression, which is very characteristic. The tongue is often coated. In some cases there is a slight rise of temperature, and increased frequency of micturition. Incontinence of urine also is not at all an uncommon symptom in these cases.

The urine is often characteristic; it is light in colour, and, though often clear on passing, on standing shows a cloudiness, which has been described as appearing as if smoke had been blown into it. It is acid, and sometimes contains a trace of albumen.

In infants the napkins are stained a brownish-yellow colour, and this fact is often the first thing to draw attention to the condition. On centrifugalising and staining with methylene blue the bacillus coli is seen in large numbers.

The bacilli are apt to disappear at times from the urine and reappear again from time to time.

In boys with phimosis, it has been observed that, after circumcision, the bacilli sometimes disappear without further treatment.

2. *Cases with subacute constitutional symptoms resembling a mild attack of typhoid.* This is, I think, the commonest type in older children. Seven out of my fifteen cases were sent into hospital with the suggested diagnosis of typhoid. The facies was very similar, and at once attracted attention. There was the same tired apathetical expression; there was generally a history of vomiting, malaise, anæmia, and some abdominal pain, for a week or two previously. The tongue was always coated, and generally very markedly so. The temperature was generally normal or subnormal, but was sometimes remittent. The bowels were constipated or normal.

There was no abdominal distension, and no enlarged spleen. Widal's test, in most cases repeated once or twice at an interval of a few days, was always negative, and there was generally a considerable degree of leucocytosis.

The urine had the typical cloudy appearance, and was found to be acid, and to contain pus, sometimes in considerable amount, and often traces of blood. The bacillus coli was found to be present in large numbers.

3. *Acute infections with local symptoms, referable to the bladder or kidney.*—These cases are the easiest of diagnosis, as the local symptoms at once draw attention to the condition.

They fall naturally into two groups :—

1. Cases of cystitis; and
2. Cases of pyelitis and pyelo-nephritis.

(1) *Cystitis.*—This is the more frequent form in older children. The constitutional symptoms may be severe, with high temperature, vomiting, very coated tongue, malaise, and anorexia.

There is generally some pain in the hypogastrium, and this may be severe, and in some cases may simulate appendicitis.

There is generally also increased frequency of micturition, pain on micturition, and often incontinence.

Sometimes there are rigors and sweats. In girls there is often also vulvitis accompanying the cystitis.

The urine is found to be acid, to contain pus, albumen, squamous epithelium, and not infrequently blood.

Both pus and blood in some cases are in large amount. The bacillus coli is found to be present in large numbers.

(2) *Pyelitis and pyelo-nephritis.*—In these cases, the onset is generally acute, with high temperature— 104° – 105° —severe headache, mental perturbation, and extreme illness. Often there are

rigors, and these are very characteristic of bacillus coli infections, as they hardly ever occur in children in any other disease except infective endocarditis, pyemia, and malaria.

In some cases the temperature is not raised, and the pulse is not much quickened. It is said that the memory of the events of the illness is afterwards very vague.

Pain is felt in the region of the kidney, and is sometimes severe. The pain may run down the ureter, and occur in paroxysms, resembling renal colic. Not infrequently one or other kidney is found to be enlarged and tender, the renal enlargement is in some cases transitory or intermittent, disappearing rapidly, and perhaps next affecting the opposite kidney. Sometimes also there is an intermittent discharge of pus, the subsidence of the renal enlargement coinciding with a free flow of pus. Hence it appears that the pain and enlargement of the kidney are due to the distension of the renal pelvis with pus, owing to blocking of the ureter.

Hæmaturia is also sometimes present, and there may be increased frequency of micturition, pain on micturition, and pain in the pelvis.

The urine is nearly always acid, and is generally not foul on passing, though on standing it soon becomes offensive, and at the same time becomes alkaline. In some cases, however, it is foul on passing.

These characteristics are due to the fact that the bacillus coli is able to thrive in acid urine, and does not decompose urea into ammonia. Hence the bacillus coli is found present in large numbers, and often in pure culture, the acidity of the urine being inimical to other organisms. After passing it becomes alkaline and offensive owing to contamination with ammonia-producing organisms.

The urine also exhibits a characteristic turbidity or cloudiness, which is likened by Pardoe to the sheen or lustre of shot silk, and has a peculiar odour, which the same writer likens to the smell of a mixture of weak carbolic lotion and rotting fish.

The urine generally contains pus, but the pus is apt to disappear and reappear from time to time, sometimes being present in large quantity and sometimes absent altogether. The reason of this has been already referred to.

Epithelial cells from the kidney, ureter, and bladder may also be found, and occasionally there are renal casts, though these are generally absent. Albumen is present generally in proportion to the amount of pus, and sometimes there is blood, which may be in large quantity.

Examination of the blood shows a more or less marked anæmia, and generally a leucocytosis, averaging about 20,000.

The lowest in my cases was 9,500, and the highest 32,500. The anæmia develops rapidly, and, as suggested by Durante, is probably due to a specific hæmolysis.

In culture, the blood is nearly always found to be sterile.

4. *Cases with acute abdominal symptoms resembling "acute abdomen."*—In some cases the local symptoms are very acute, with severe pain in the

abdomen, and distension, coated tongue, vomiting, and obstinate constipation, and may present the exact clinical picture of an "acute abdomen."

Such cases have several times been mistaken for acute appendicitis, and acute intestinal obstruction, and have been submitted to operation. Hence, in all cases resembling an "acute abdomen" in children, bacillus coli infection should be kept in mind. One of my cases, in a boy of 13, exactly resembled an attack of acute appendicitis, but, fortunately, his mother making some remark about his urine, I looked at it and saw that it contained a large amount of blood and pus.

5. *Acute infections with severe constitutional symptoms, local symptoms being latent.*—In this form the onset is acute and sudden, suggesting an attack of influenza or pneumonia, and in the majority there is nothing at first to direct attention to the urinary apparatus. Some cases more resemble an acute attack of typhoid or infective endocarditis.

The child is taken acutely ill with severe headache, fever, malaise, coated tongue, vomiting, and frequently rigors.

The rigors are recurrent, and are very characteristic of the disease.

The skin may be hot and dry or moist. The pulse is rapid, also the respiration, but not out of proportion to the pulse.

Sometimes herpes appears on the lips. Frequently the abdomen is somewhat distended, the bowels may be irregular, and the edge of the spleen may be palpable. In some cases nervous symptoms are marked, such as sleeplessness, marked restlessness, muscular twitchings, and, in older children, delirium.

There may also be strabismus, stiffness of the neck, and head reaction, accompanied by sharp cries and sometimes convulsions. In fact there are all the symptoms of meningism, as in other acute infective conditions. The temperature may remain high for several days; others fall abruptly as in acute pneumonia. More often it is irregular and remittent, or intermittent with chills and sweats, suggesting infective endocarditis, pyemia, or malaria. Some cases run an afebrile course. The course of the disease is apt to be marked by intermissions and relapses.

The foregoing description applies more to cases in which the infection takes the form of a pyelitis or pyelo-nephritis than to those in which the less absorbent mucous surfaces of the ureters and bladder are involved, but in most instances the clinical aspect is rather that of a cysto-pyelitis, and a sharp differentiation of the renal from the vesical infections is impossible.

6. *Acute "cerebral" cases.*—These are the most remarkable of all, presenting all the appearance of acute meningitis one day, and no symptoms of any sort, perhaps, the next.

The onset may be with convulsions, either general or unilateral, the patient passing into a state of eclampsia, with loss of consciousness.

There may be rigidity of the trunk and limbs, and opisthotonos.

Strabismus is not uncommon, and either delirium or drowsiness are both very frequent. The respirations are rapid and shallow, and the pulse may be very rapid. Vomiting is not uncommon, and there is marked distress and dislike to being disturbed.

The child may present all the appearances of serious cerebral disease, and death may appear imminent, and yet in a few hours, all these severe nervous symptoms may have gone, and the child be playing with his toys again.

This apparent recovery, however, is but temporary, and a fresh attack shortly supervenes.

This type of the infection is well exemplified in the following case recorded by McCrea.

"An infant of $7\frac{1}{2}$ months, apparently perfectly healthy, became suddenly ill, with a temperature of 104° . The body was rigid and extended, there was complete unconsciousness, and right-sided convulsions, which lasted three hours. The convulsions gradually became less severe and then ceased. The child then slept six hours and woke up quite conscious, with a temperature of 100° , but with the right arm and leg completely paralysed. During the next few days rapid improvement took place, and the paralysis disappeared. There was never any vomiting. The child then remained perfectly well for fourteen days, after which attacks of unconsciousness with high temperature at intervals of a few days supervened. These attacks sometimes lasted six hours and were followed by a quiet sleep, after which the child woke up apparently well and ready to play.

The urine was found to be acid and to contain pus and the bacillus coli in large numbers.

Complete recovery followed treatment with Pot. Citrat. and Urotropin.

A similar case came under my own notice in a little girl of 4 who, when apparently perfectly well, had an attack of convulsions and unconsciousness lasting some hours.

Similar attacks recurred at intervals of two or three days, lasting some hours, and always followed by a quiet sleep, after which the child woke up, apparently perfectly well.

A similar condition of the urine was present in this case, but unfortunately the child died in an attack of convulsions.

In these cases there is no doubt an intense toxæmia.

7. *Chronic persistent infections*.—These are mostly met with in older children, but are occasionally seen in infants.

They may assume the form of simple persistent bacilluria, with slight or no constitutional and local symptoms, or there may be periodical exacerbations.

The subjects of this chronic infection are anæmic and poorly nourished, and have a dull apathetic facies, which is characteristic. The tongue is generally more or less coated, and there may be slight elevation of temperature extending over long periods.

Incontinence of urine is not uncommon.

The periodical exacerbations may assume the form of "feverish attacks," which are attributed to various vague causes, or of "bilious attacks" accompanied by headache and vomiting, and lasting several days.

Chronic infections are stated by several observers to be much more rare than the acute infections, but I think they are not at all uncommon among older children.

I think there is very little doubt that many of the cases of so-called "cyclical" or "periodic" vomiting in children are in reality cases of chronic bacillus coli infection.

Three of my cases had a history of attacks of headache and vomiting, recurring periodically, and lasting several days.

The chief interest of chronic bacilluria, with no symptoms, lies in the fact that several such cases have been recorded which ended fatally in uræmia. Chronic infections may persist for months or years. Pardoe records a case in a boy of 14 which had lasted 10 years, and another case is recorded which had lasted 16 years.

The urine in chronic infections during the quiescent periods may appear absolutely normal. In the acute phases there may be a slight degree of the peculiar odour and a slight turbidity, which in some cases is due to the presence of countless numbers of the bacilli.

8. *Secondary cases* are quite exceptional in children. When present they are usually secondary to calculus, and as a rule the removal of the cause is followed by cure of the infection.

One cannot but be struck by the close clinical resemblance between cases of bacillus-coli infection and acidosis. The clinical types of the two conditions are strikingly similar. Many cases of cyclical vomiting are associated with attacks of acidosis; also, acidosis is especially apt to occur in septic intestinal conditions, and in every fatal case of cyclical vomiting, lesions of the alimentary canal have been found.

Acidosis is due to a failure on the part of the liver to perform its function properly in regard to the oxidation of fats, and a variety of exciting causes may precipitate attacks, but everything points to there being some underlying condition which is the primary cause, in the shape of an intoxication or infection of the liver cells, and I think, in all probability, the primary cause of acidosis is an intoxication of the cells of the liver by the toxins of the bacillus-coli, the various exciting causes acting merely, as it were, as the last straw.

I think "cyclical vomiting" is probably in all cases due to an intoxication of the liver cells by the toxins of the bacillus-coli, there being in severe cases a fatty-acid intoxication superadded, owing to the liver being so poisoned that it is quite unable to perform its function in regard to the metabolism of fat.

Relapses.—The marked tendency to relapse is a very troublesome feature of bacillus-coli infections.

Relapses may occur time after time on the slightest indiscretion as regards diet or exercise, or without any obvious reason at all, and though every care is taken to avoid them. Even after a considerable period of convalescence, and when the trouble seems past, a relapse often occurs.

Diagnosis.—The chief difficulty lies with cases presenting no local symptoms. When local symptoms are present, attention is at once drawn to the kidney or bladder, and an examination of the urine clears up the diagnosis.

The appearance of the urine is often characteristic, presenting the turbidity, cloudiness, or sheen resembling shot-silk. Microscopical

examination shows, in the acute cases, pus and epithelial cells from various parts of the urinary tract, perhaps a few casts, and swarms of bacilli, which are more or less motile.

On centrifugalising, some polynuclear cells are always seen, and, as Dudgeon has observed, "phagocytosis is feeble, the bacilli being extra cellular, a fact which contrasts strongly with what is seen in typhoid."

The bacillus coli communis has the same appearance and staining reaction as the typhoid bacillus, but is generally shorter. Like the latter, it presents variations in size, is motile, and is Gram-negative. It is identified by the following typical reactions:—

- (1) The formation of indol in broth culture.
- (2) The coagulation and acidification of litmus milk.
- (3) The acidification of McConkey's fluid, with gas formation.
- (4) The reduction of neutral red to yellow fluorescence.
- (5) The growth of red colonies on Conradi-Drigalski's neutral bile salt agar.
- (6) The formation of gas in glucose-gelatine shake culture at 22° C., without liquefaction of the gelatine.

The presence of pus in an acid urine should always excite suspicion of a bacillus-coli infection.

By far the commonest infection of the urinary tract in children is that due to the bacillus-coli.

In infants the brownish-yellow staining of the napkins often suggest the condition.

Rigors in young children are very characteristic of the infection, though in older children they are not uncommon in infective endocarditis, and occur also in pyæmia and malaria. In incontinence in children, a bacillus-coli infection should always be excluded as the cause.

In indefinite cases of apparently mild typhoid, on a Widal test proving negative, attention should always be directed to the urine. The facies of bacillus-coli infection is very suggestive of typhoid. There is the same tired, depressed, apathetic look, and the tongue is always coated, and often very markedly so.

The two conditions are, however, easily differentiated by a Widal test, a blood-count, and an examination of the urine.

In bacillus-coli infections there is almost always some leucocytosis, and often a considerable degree, whereas in typhoid there is leucopenia.

In all cases of cyclical vomiting, also, an examination of the urine should be made in the first place.

In the acute cases with severe constitutional symptoms, and especially in the "acute cerebral" cases, there is often nothing whatever to call attention to the urinary tract; hence in all such cases, where the cause is obscure, a bacteriological examination of the urine should be made to avoid error.

The onset may suggest an infective fever, pneumonia, meningitis, or acute otitis media.

In the more chronic cases tuberculosis of the bronchial or abdominal glands may be suspected, and in those with pronounced local symptoms calculus, or tuberculosis of the bladder or kidney.

Urinary tuberculosis is rare in childhood; calculus is not uncommon, but is much less frequent than bacillus-coli infections.

Cases of the "acute abdomen" type may easily be mistaken for acute appendicitis or intestinal obstruction, and an unnecessary operation may be performed, unless the urine is examined in all such cases.

Dudgeon and Ross have shown that though the opsonic phagocytic indices of the blood are low, they are not reliable, and that the agglutination test is of no value.

They point out that normal human serum has no bactericidal effect on the bacillus-coli.

It is evident that the only way to avoid errors in diagnosis is to make a routine bacteriological examination of the urine in all obscure cases.

Complications and sequelæ are fortunately rare. Box and Thursfield state that repeated attacks in early life may eventually lead to the production of hydro or pyo-nephrosis.

Box reports a case of chronic bacilluria which developed uræmia in three years and ended fatally. Jeffreys also reports a similar case, and another which became anæmic, but recovered under treatment with a vaccine.

Prognosis.

1. *As to life*—is good. Morse records a series of 50 cases with only 1 death, and Jeffreys a series of 60 with 6 deaths. In my 15 cases there were no deaths.

2. *As to duration*.—The general experience is, that in children, in acute cases, the tendency is towards rapid recovery under treatment.

Acute cases, however, may become chronic, and last weeks, months, or even years; three or four months in such cases is a common duration, and cases have been recorded lasting ten and fourteen, and even sixteen years.

The temperature may fall and all symptoms subside in a week or two, though pus or bacilli, or both, may remain in the urine for weeks. As long as bacilluria persists, there is a danger of sudden recurrences of acute symptoms.

Relapses are very prone to occur.

Jeffreys considers it one of the most stubborn diseases to cure. In his 60 cases 21 were discharged cured, 6 unimproved, and 23 with pus still present in the urine.

Of my 15 cases, 11 recovered in periods varying from two weeks to nine months, and averaging six or seven weeks; 1 was discharged with persistent bacilluria, but otherwise perfectly well, and 3 are still under treatment.

Treatment.—All are agreed that the essentials in treatment are absolute rest in bed, and a milk diet until all symptoms have subsided. Also that plenty of diluents should be administered to induce free diuresis.

Getting up too soon, or a too early increase in the diet, are sure to be followed by a relapse.

With regard to drugs, there is great diversity of opinion. Most authorities recommend that the urine should be made alkaline by means of pot. citrat. or sod. bicarb.

Others hold that it should not be made alkaline, as, theoretically, alkalies should do harm, because the bacillus coli grows more luxuriantly in alkaline than in neutral or acid media, and moreover, there is more

opportunity for concurrent infection with other organisms, if the urine is alkaline. Hence they advise that the urine should be kept acid with sod. phosph. ac. This line of treatment, however, does not appear to be very successful.

Another suggestion is that the growth of the bacilli will probably be inhibited by a different reaction from that to which it has been accustomed, and that therefore, if the urine is acid it should be made alkaline, and if alkaline, acid.

The general consensus of opinion is that alkalies do good, and the true explanation of this fact is probably that suggested by Thos. Horton, who showed that the ingestion of the bacillus coli by leucocytes was much more active in an alkaline than in an acid medium.

The best drugs for the purpose of rendering the urine alkaline are the citrate, acetate, or bicarbonate of potash.

The dose of each may range from 10 gr. t.i.d., in plenty of water, increased to 30 or 40 gr. if necessary to attain the desired effect.

The citrate in large doses is apt to cause diarrhœa, which has the disadvantage of concentrating the urine, but the acetate does not act in this way.

If the urine is ammoniacal, this condition should first be remedied by the administration of sod. phosph. ac., or benzoate of sod. or am., alkalies then being exhibited.

It is useful to combine hyoscyanus or belladonna with the alkali to act as a sedative.

Pardoe recommends sandalwood oil, in the form of sanmetto, as the best sedative drug.

In many of the milder cases, the administration of from 10–20 grs. of pot. citr. combined with 10–20 mm. of tr. hyosc., t.i.d., with plenty of diluents, and rest in bed on a milk diet, are all that are necessary to effect a cure.

Urinary antiseptics.—With regard to the value of urinary antiseptics, again, there is a great deal of difference of opinion. Urotropin, helmitol, salol, and boracic acid, have all had an extended trial, and according to some, have proved more or less disappointing.

Some observers state that urotropin has no antiseptic action as regards the bacillus coli, and others report cures apparently due to it.

Several recommend the combination of urotropin with alkalies, but Prof. Dixon, of King's College and Cambridge University, states most definitely that, "in cases where the urine is alkaline or neutral, urotropin is valueless as a urinary antiseptic, whereas in acid urine, a small proportion, varying with the degree of acidity, is converted into formic aldehyde, which may be detected in the urine, and is one of the most powerful of all known antiseptics."

Hence he advises that the urine should first be made acid in cases where it is alkaline.

If Prof. Dixon is right, however, it is difficult to see how it happens that, shortly after the administration of urotropin, formic aldehyde is found in the cerebro-spinal fluid, which is alkaline.

Other observers have found benefit from other antiseptics, especially the benzoates of soda and ammonia, boracic acid, and salicylate of soda.

Pardoe recommends the combination of benzoates of soda and ammonia with alkalies. He also strongly advises against local instrumental interference, e.g., irrigation of the bladder, as in his opinion it aggravates the condition.

Jeffreys, on the other hand, recommends alkalies, antiseptics, and bladder irrigation, with the subsequent injection of iodoform emulsion. He also attaches much importance to the treatment of the concomitant bowel condition, by washing out the large intestine and keeping it empty by means of aperients.

On the whole the evidence is distinctly in favour of urinary antiseptics, one proving successful in one case, and another in another.

The most effective antiseptics appear to be the benzoates of soda and ammonia, biborate of soda, boracic acid, and urotropin.

In my cases I found a mixture containing citrate of potash, bicarb. of soda, and biborate of soda, generally effected a cure. If it did not, I then tried benzoate of soda or ammonia and urotropin, or sod. biborate and sod. benzoat, and these proved effectual in several cases which appeared to have come to a standstill under alkalies.

Some cases improve considerably with alkalies at first, and then appear to come to a standstill, with slightly turbid urine, containing a little pus, and a few bacilli, and I found that in these cases a mixture containing sod. benzoat. and sod. biborat. often effectually cleared up the condition.

Serum therapy.—Dudgeon and Ross claim excellent results from the use of anti-bacillus coli serum in cases of acute pyelo-nephritis. In sub-acute cases it was less effective.

They advise doses of 25 c.c. daily, for three days.

In 12 cases so treated, rapid and permanent recovery was effected in 5, in 4 there was considerable improvement, and only 2 were not benefited at all.

To prevent the severe joint-pains and rashes that sometimes occur, they advise the simultaneous administration of calc. lactate in doses of 20 gr., t.i.d.

Vaccine therapy.—The same observers also found vaccines of great value, especially in acute cases.

They recommend that the vaccine should always be autogenous, and should be administered intra-muscularly every five days.

In 100 cases, they found that in the acute forms, complete recovery was the rule under vaccine therapy, but in chronic cases, complete recovery was the exception, though considerable improvement was effected in most.

Hartwell and Strutz had less satisfactory results, and conclude that vaccines are efficient in relieving symptoms in mild cases of cystitis, but are without value in severe cases. Also that they probably hasten recovery in cases of pyelitis, but have no influence on bacteriuria.

Wulff, in 23 cases treated with vaccines, had 18 successes, some complete and some partial.

Billings also had excellent results. Morse was disappointed with the effect of vaccines in children. Rolleston has on the whole seen good results. Jeffreys found the severe cases respond best to vaccines. The evidence on the whole, therefore, is distinctly in favour of vaccines, especially in acute cases.

In 14 out of my 15 cases, a cure was effected by means of alkalies and antiseptics. In the 15th, as bacilluria still persisted at the end of two months, an autogenous vaccine was administered, beginning with a dose of 5,000,000 and increasing it up to 30,000,000.

The interval between the doses was five days, and each successive dose was about double the previous one.

The bacilluria, however, did not appear to be affected in any way by the vaccine.

Dose of vaccine.—Butler Harris recommends a dose of from 2,000,000 to 5,000,000 every five to ten days for children, the interval being increased as one proceeds.

To avoid rigors and fever, he advises using young cultures only, from ten to twelve hours old, and the washing of the organisms in saline, and then precipitating by centrifugalising, before finally emulsifying and sterilising at 60° C.

McCrea recommends for a child of 1 year 3,000,000 for the first dose, repeating it in two days, and then gradually extending the interval according to progress.

In a case reported by him, in a child of 15 months, who had been ill three weeks, 1,000,000 was given for the first dose, 2,000,000 in two days, 4,000,000 in six days, and 5,000,000 four days later. In this case complete recovery ensued.

Parkinson reports a case in a girl of 10, who was given 20,000,000 in the first dose, 30,000,000 in twelve days, and 40,000,000 twelve days later. This child, however, though apparently cured at first, relapsed five weeks later.

Surgical Treatment becomes necessary

- (1) In chronic cases with pyo-nephrosis ;
- (2) When abscesses form in the kidney.

Thomson Walker has collected forty cases of acute pyelo-nephritis in which operations were performed, with seven deaths, giving a mortality of 17.5 per cent.

The operations performed were, nephrotomy in 12 cases, nephrectomy in 17, decapsulation and opening of surface abscesses in 6, partial resection in 2, bilateral nephrotomy in 2, and nephrotomy on one side and nephrectomy on the other in 1.

All the seven deaths occurred in the twelve nephrotomy cases. The best results were obtained by nephrectomy in the acute stage.

The present position as regards treatment may be summarised as follows :—

In the majority of cases, recovery takes place under treatment with alkalies alone.

In some of those which do not recover under alkalies, a cure is effected by urinary antiseptics, the most successful being the benzoates of soda and ammonia, boracic acid, biborate of soda, urotropin, and salicylate of soda; in others an autogenous vaccine proves successful. A small minority of cases proves refractory to all forms of treatment. When surgical treatment becomes necessary owing to formation of pus in the renal pelvis or kidney substance, the best results are obtained by nephrectomy.

AN ANALYSIS OF 312 CASES OF LARYNGEAL DIPHTHERIA, WITH AN OUTLINE OF THEIR TREATMENT.

By F. V. SCHOLES, M.B., C.B. (Melb.).

THE present paper has been written with a view of putting forward two facts—first, that laryngeal diphtheria is very largely a preventable disease; and secondly, that with adequate treatment the case mortality appertaining at present could be very materially reduced. The treatment of cases will be indicated as fully as time permits, and the suggestion thrown out that the essence of the prevention of laryngeal diphtheria is in the prompt and thorough treatment of faucial diphtheria.

The cases under review number 312, and include every case of laryngeal diphtheria coming under the writer's care from 1st April, 1910, to 1st April, 1911—that is, from the beginning of one diphtheria season to the beginning of the next.

It is proposed first of all to deal with various etiological factors, excluding such as are of purely academic interest.

Like many other diseases of infancy, laryngeal diphtheria is more common in boys than in girls. The following figures would indicate not only that fact, but also that it is more fatal to boys than to girls:—

Sex.			Number.	Deaths.	Mortality.
Males	...	...	178	16	9.0
Females	...	...	134	5	3.7
Total	...	...	312	21	6.7

I am convinced that this conclusion is correct, not only from these figures, but also from observation of some 300 additional cases.

With respect to the age incidence, laryngeal diphtheria is decidedly uncommon in the first year of life. The incidence then rises rapidly until the end of the third year. A steady diminution then sets in, and after the tenth year it is relatively rare. The influence of age on mortality is very marked, as is shown in the following table:—

Age.			Number of Cases.	Number of Deaths.	Mortality per cent.
Under 1	...	...	6	1	16.6
1	...	...	28	4	14.3
2	...	...	49	1	2.0
3	...	...	54	7	12.9
4	...	...	49	2	4.1
5	...	...	39	3	7.6
6	...	...	29	1	3.4
7	...	...	31	2	6.4
8	...	...	12	...	...
9	...	...	5	...	...
10	...	...	6	...	...
Over 10	...	...	4	...	...
Total	...	...	312	21	6.7

Under the age of 3 most of the deaths result from obstruction to breathing, and its consequences; over the age of 3 most of the deaths are due to toxæmia. It is rare, indeed, for any child under the age of 3, suffering from diphtheria, to die of toxæmia.

Another important etiological factor, having a marked effect on the prognosis, exists in the form of recent or present local disease. The patient was convalescing from measles in nine cases, from pneumonia in fourteen, and from whooping-cough in four. In all these a gateway had been left for an overwhelming invasion.

Five of the children were idiots. The significance of this fact can be readily grasped.

The proportion of laryngeal to other forms of diphtheria was about the same as that usually noted. Out of 1,224 diphtheria cases, 312 were laryngeal—a percentage of 25.5.

There is need of readjustment of the current ideas concerning the frequency of primary laryngeal diphtheria. In the present paper the view is very strongly held that it is a comparatively rare affection, and that the overstatements made regarding it are due to the omission of throat examination in all cases. The following data support this view:—Of 312 cases, in 264 was the throat examined at the time of coming under treatment. In 256 there was either membrane on the tonsils or faucial pillars, or evidence of its recent presence there. The remaining eight were “clear” (of these eight, five gave positive cultures from the throat, and two others had a muco-purulent nasal discharge). In forty-eight cases the throat was not examined, owing to the urgency of symptoms or other cause.

It is not quite safe to conclude that the percentage is such a very small one as is indicated above. For one thing, it is probable that a certain number of cases of primary laryngeal diphtheria remained undiagnosed. This is especially true in children over 4 years of age. Again, during epidemics of measles and similar local affections, primary laryngeal diphtheria occurs fairly frequently. Whatever importance, however, may be assigned to these two factors, they cannot imperil the general conclusion, that laryngeal diphtheria in the great majority of cases is secondary to, and the result of, primary faucial diphtheria.

A reasonable objection may be urged, that possibly the faucial is secondary to, or coincident with, the laryngeal involvement. The writer has satisfied himself that this is not so, both from the history of cases and the local examination.

Now, faucial diphtheria, if adequately treated with antitoxin, will never extend so far as to involve the larynx. The writer has had under his care some 3,000 cases of diphtheria, the majority being purely faucial. Not one case developed laryngeal symptoms after the time of coming under treatment.

If, then, faucial diphtheria can be absolutely prevented from spreading to the larynx, and if laryngeal diphtheria is nearly always secondary to faucial diphtheria, then the former should be very largely a preventable disease. Unfortunately, other elements enter

into the question, with the result that laryngeal diphtheria exists under four conditions—

- (1) The primary form occurs, but is comparatively rare.
- (2) A faucial diphtheria is passed unnoticed by the mother, and extension of the disease proceeds.
- (3) The physician diagnoses follicular tonsilitis—quite a justifiable error, as the two conditions may simulate one another very closely.
- (4) An insufficient dose of antitoxin is given.

Eliminate these, and laryngeal diphtheria will cease to exist. The difficulties, however, are obvious, and the question will not be further considered.

Attention may now be given to the methods and the results of treatment adopted in these 312 cases. For this purpose a division has been made into—

- (a) Cases not submitted to operation;
- (b) Cases submitted to operation.

The former class includes 172 cases. One patient died while being removed from the ambulance, and will be omitted from the following tables.

The essential feature in the treatment consisted in the prompt administration of an adequate dose of antitoxin. The amount to be given was fixed by a consideration of the following factors:—

- (1) The estimated amount of toxæmia present.
- (2) The estimated rate of spread of membrane.

Accuracy in these points can naturally only be secured after a large experience of laryngeal diphtheria, but a fair estimate can certainly be obtained, and for the rest, it is only necessary to remember that it is far better to give too much than too little.

The results of antitoxin treatment of these 171 cases are given thus:—

Dosage (in thousands of units).	Number of Cases.	Number of Deaths.
5 to 15	56	1
15 to 25	87	1
25 to 35	16	2
35 to 45	11	3
45 to 55	1	...
Total	171	7

The total amount of antitoxin administered was 3,004,000 units, the average dose for each patient being 17,600 units.

Brief consideration may now be given to the seven fatal cases. Two patients died of toxæmia within sixteen hours after being first seen; another, a baby of five weeks, died of gastro-enteritis and asthenia following empyema; the fourth died of meningitis three weeks after the onset of diphtheria; and the remaining three succumbed to late heart failure, one lingering on for six weeks. Two of these patients showed definite signs of congenital syphilis, while two others were doubtful in that respect.

To put the matter plainly, the total mortality was 4·1 per cent. The first two cases can hardly be seriously considered, and the remaining five, the death of one of whom at least cannot be ascribed in any way to diphtheria, show a mortality of 2·96 per cent.

Measures other than the administration of antitoxin played an important part in the treatment. In cases where the obstructive symptoms were not so marked as to prevent it, local treatment of the throat and nose was energetically carried out by means of saline douches, which, while mild and non-irritating, will rapidly clear up the most fetid throat. Neither in these cases, nor in those with more severe laryngeal obstruction, was any attempt made at local medication of the larynx in the form of caustics. Kipling's vision, in "A Second-rate Woman," of a lady virtually intubating an infant with a stick of caustic, is vivid, but impracticable.

Inhalations were given a fair trial, weighed in the balance, and found wanting. As regards the steam tent, it certainly appeared to do good in some cases, especially in very young children, but for the last nine months the writer has practically discontinued its use. Similar results are achieved more promptly by the aid of sedatives, and morphia holds an important place in the treatment of laryngeal diphtheria. It is to be regretted that exact figures are not obtainable as to the extent of its employment in these 312 cases; but it was used in a very large number, in doses of $\frac{1}{40}$ to $\frac{1}{20}$ to $\frac{1}{10}$ grain, and with, on the whole, satisfactory results. Its best effects were seen in children under 4 years of age, in whom laryngeal spasm plays such an important part in any laryngeal obstruction. It is safe to say that many of these 171 patients would have required intubation had not morphia been administered.

Brandy was found to be the most serviceable stimulant, given early, either by the mouth or, along with saline, by the rectum. During the period of convalescence, small doses of strychnine and the syrup of hypophosphite of iron were of great value as tonics.

An initial purge, absolute rest in bed for from two and a half to six weeks, and a liberal diet, were constant in the scheme of treatment.

Cases submitted to Operation.

These totalled 140, being 45 per cent. of the whole series. For convenience, a table is here inserted:—

Age.				Number of Cases.	Number of Deaths.
Under 1	...	...	...	1	...
1	...	...	...	13	3
2	...	...	...	25	1
3	...	...	...	24	1
4	...	...	...	26	2
5	...	...	...	15	2
6	...	...	...	13	1
7	...	...	...	15	...
8	...	...	...	6	...
9	...	...	...	1	...
10	...	...	...	1	...
Total	...	...	...	140	13

The mortality per cent. therefore, of all cases submitted to operation, was 9.2. Five of the fatal cases were moribund when first seen, and lived for periods varying from a few minutes to a few hours. By the elimination of these five cases, the mortality per cent. can with justice be reduced to 5.9.

The remaining 135 patients were all intubated and treated with antitoxin, with most gratifying results. It will be noted from the following table that the antitoxin dosage for these 135 patients was considerably greater than that for the 171 not submitted to operation:—

Dosage in thousands of units.	Number of Cases.	Deaths.
5 to 15	3	...
15 to 25	47	2
25 to 35	50	3
35 to 45	27	3
45 to 55	5	...
Over 55	3	...
Total	135	8

The total amount of antitoxin administered to these patients was 3,868,000 units, the average amount for each being, therefore, 28,600 units.

Of the eight fatal cases, six died with the intubation tube in position. The cause of death was asphyxia in one case, toxæmia in two (in both of these death occurred on the second day of treatment), broncho-pneumonia in two, and septicæmia in one. The other two deaths occurred long after total relief had been given by intubation; the local symptoms had subsided, and the tube had been removed. In one the cause of death was broncho-pneumonia, and the other pyæmia.

The results of intubation may therefore be summarised thus:—

Total cases, 135. Died with tube in position, 6; died after removal of tube, 2; secondary tracheotomy performed, 7; cured entirely by intubation, 120; mortality per cent., 5.9.

The seven secondary tracheotomies were performed on account of retention of the intubation tube. It may be well here to give some particulars as to the frequency of this distressing, though interesting complication. It is difficult to arrive at any arbitrary definition of what constitutes a "retained tube," but for the purpose of this paper ten days has been fixed upon as the limit of normal intubation—that is, any patient who is compelled to wear the intubation tube for more than ten days is considered to be a subject of "retained tube."

Thirteen patients enter into this class. Of these, two died with the intubation tube in position; four were cured by persistent intubation; four were cured by secondary tracheotomy; three had secondary tracheotomy performed, with resulting "retained tracheotomy tube" (these three patients are still wearing the tube).

The practice adopted was to continue intubation until the expulsion of the tube became so frequent as to endanger the patient's life, in which case tracheotomy was then performed. After a week of rest given to the larynx, an attempt was made to dispense with the tracheotomy tube, and if necessary reintubation was resorted to. In some cases this had to be done over and over again, and several of the successful cases were intubated dozens of times, and wore the tracheotomy tube for periods of from one to four months.

Medication of the intubation tube with powdered alum gave, on the whole, good results, as also did counter irritation of the neck by means of mustard plasters and leeches. A certain number of cases, however, will inevitably reach the stage above indicated, and cricoid ulceration with septic infection of the larynx remains, in the writer's opinion, the most to be dreaded and the most bitterly to be regretted complication that can occur in laryngeal diphtheria.

Antitoxin in large doses has a marked effect on the length of time that the intubation tube requires to be worn. The average length of time for the 122 patients who succeeded in finally dispensing with the tube was 3.4 days.

The periods may be tabulated thus:—

Time of wearing Intubation Tube.					Number of Cases.
24 hours or under	...	...	...	...	26
2 days	...	...	...	...	30
3 days	...	...	...	...	21
4 days	...	...	...	...	16
5 days	...	...	...	...	11
6 days	...	...	...	...	3
7 to 10 days	...	...	...	...	11
Over 10 days	...	...	...	...	4

It should be mentioned that thirteen of the patients were intubated for a period less than one hour. These cases were all of the same type, and all but two were over 4 years of age. The obstructive symptoms were not urgent till the membrane, loosened five or six hours after the injection of serum, began to occlude the lumen of the larynx and, in most of the cases, the trachea.

Intubation then entirely freed the still somewhat adherent membrane, and the immediate removal of the tube was followed by the expulsion of a cast. This class of case, though in it intubation presents a certain amount of danger, is the most successful of all the many types of intubation cases. One taken at random, which illustrates a common course, reads thus: Girl, aged 3, came under treatment on 24th May—Was retracting deeply, very restless, and the face and lips were slightly cyanosed. Was intubated at once with a No. 2 vulcanite tube, with instant relief. Examination then showed membrane on the tonsils and pharynx; there was no nasal discharge, and the temperature was 100.6. The patient was put to bed, given 16,000 units of antitoxin, and passed a good night. The following morning, 25th May, child not looking well; colour rather blue, and pulse rapid. Given 10,000 units of antitoxin, and ordered rectal

salines, 4 ounces to be given four-hourly, each to contain 2 drachms of brandy. 26th May—Child looking well; breathing comfortably. 27th May—Tube removed; uninterrupted convalescence.

In cases where the child was not comfortable after removal of the tube, it was found advisable to delay its reinsertion as long as possible.

Considering the severity of the primary disease, complications and sequels are decidedly rare. In the following list, explanations and comments are, as far as possible, dispensed with:—

Total cases, 312.

(a) *Heart complications*:—

Early weakness, due to obstruction and toxæmia, 81.

Late weakness, due to degenerative changes in muscle and nerve, 95.

Two points of very doubtful importance may be stated—that cardiac irregularity developed in 54 cases, and a systolic murmur at the apex in 86 cases.

(b) *Kidney complications*:—

Slight or transient albuminuria, 45.

Marked or persistent albuminuria, 82.

Nephritis, 6.

The cases classed as “nephritis” showed definite signs and symptoms of that condition.

(c) *Paralysis*, 6.

(d) *Pneumonia and broncho-pneumonia*, 16.

In 11 cases it followed intubation or tracheotomy.

Empyema, 1.

Hæmorrhagic rash, 21.

Otitis Media, 11.

Meningitis, 1.

Dacryocystitis, 1.

Suppurative adenitis, 1.

Pyæmia, 2.

Antitoxin rash, 115.

The most noteworthy points in this list are the extreme rarity of paralysis (1.9 per cent.) and the extreme frequency of antitoxin rashes (36.8 per cent.). Both are, in the writer's opinion, due to the employment of large doses of antitoxin.

The paper now to be concluded has, it is hoped, established three facts—

- (1) That laryngeal diphtheria is very largely a preventable disease;
- (2) That it can be much more satisfactorily treated by the administration of larger doses of antitoxin than are at present generally used; and
- (3) That intubation is in every respect the most satisfactory and desirable operative measure.

When these facts receive the recognition which is their due, laryngeal diphtheria will no longer be what it is to-day—the most painful disease that the medical practitioner is called upon to witness.

DIPHTHERIA CARRIERS IN A SCHOOL EPIDEMIC.

SOME SUGGESTIONS AS TO TREATMENT.

By GARNET LEARY, M.D. (Edin.), M.R.C.P.

Sandringham (Melbourne), Victoria.

DURING February and March, 1911, an epidemic broke out in this district (about forty cases were reported), which caused no small amount of speculation as to its origin.

As the local State school children seemed to be affected most, the attendance daily falling off, the Board of Health authorities made investigation as to milk supply, drains, &c., and other likely sources without success, after which attention was centred on the Carrier Question. Throat swabs were consequently taken by the Board of Health authorities from members of the classes where the infection and infected scholars seemed to come from.

The following facts may be of interest:—

Average attendance at school before epidemic, 333·6; average attendance during time swabs were taken, 92·3; number who had diphtheria, 19.

First Class (æt. 5 to 8).—Swabbed, 19 (all those remaining in the class); former attendance, 114; two carriers of Kleb's Loeffler's diphtheria bacilli, "Jack X" and "Norman Z"; five carriers of diphtheroid bacilli; ten cases reported, five traced to carriers direct.

Second Class (æt. 9 to 10), in a separate school.—Fourteen swabbed; one carrier of diphtheroid; three cases reported; none traced to carriers.

Third Class (æt. 10 to 12).—None reported.

Fourth Class (æt. 12 to 14).—One infected from carrier; two cases reported.

Fifth Class.—Three cases reported; infection direct from carrier.

Sixth Class.—One case reported; indirectly from carrier.

The Sister of "Jack X," carrier (æt. 6), who was the only one of a family of ten who did not get a prophylactic dose of anti-toxin, developed diphtheria. A visiting friend in the sixth class probably got infected, as did her visiting cousin, who was in the fifth class. One of the two remaining patients (S.), in class five, was a brother of two class-mates of "Jack X," and sat next each other; they also contracted the disease.

The other boy (W.), in class five, may have infected his sisters and brother.

These cases all occurred within the incubation period, and about the time that other cases were infected by the carriers, and within the infected area. Prophylactic doses were given in nearly every infected house with marked success.

The origin of this epidemic could not be found apart from the school, although every investigation was made by the Board of Health authorities. The two sisters of carrier "Norman Z" (æt. 9),

who all occupied the same bed, developed diphtheria. He was sent from school as result of positive bacteriological examination. Received anti-toxin treatment. His sisters did not receive a prophylactic dose on account of the expense of the serum. Diphtheria developed a few days afterwards.

Three others, class one, who sat next to carrier "Z," developed a typical attack. The other cases attending the school could not be traced to these two carriers; but the fact remains that these five infected were in the same class. These two carriers, who had the *true diphtheria* bacilli in their throats, never showed any clinical signs of illness of any kind, nor could anything suggestive be detected, except markedly enlarged tonsils, which were observed in nearly every case.

Being interested in the carrier question, I took thirty-two swabs from promiscuous throats and nasal passages, several from likely sources in the infected area, but with a negative result. Two showed diphtheroid bacilli, one being from a patient whose tonsils had been recently excised, occupying the same bed with his two brothers. Several other diphtheroid cases had every opportunity of transmitting infection, both at home and school.

To deal with such situations in schools the best practical lessons in such an epidemic would be:—

1. Examination of throats and nasal passages; swabs to be taken from all the classes where infection seems to have arisen.
2. During an epidemic to note and isolate any child who is out of sorts, and especially those who come from infected area, until after the incubation period. Inquire about sickness of domestic pets, cats, pigeons, or if rat-infested surroundings.
3. Carriers and convalescents to be tested, if possible, by bacteriological examination, and, if need be, by inoculation tests, or other proofs of immunity to be submitted; enforced absence from school until proved non-infectious; contagion to be specially avoided—*e.g.*, kissing, cleaning school slates, drinking utensils, &c.
4. To give prophylactic dose of anti-toxin to contacts, whether from carriers, infected patients, or from residence in same house; or, if need be, in infected area, there being no necessity to close school. In contacts when bacilli morphologically resemble *true* bacilli, the inoculation test on guinea-pigs to be used to prove the virulence of the bacilli.
5. To treat diphtheroid bacilli as harmless.
6. Free distribution of serum by shire councils and municipalities.

7. Optional method of administration, either by mouth or injection. Although there is a diversity of opinion as to its administration curatively and prophylactically, the bulk of evidence is undoubtedly in favour of oral method. It is reported that of those exposed to this infection, twenty-seven contracted the disease out of 3,109 when administration was by mouth. In *British Medical Journal* (27th April, 1911), marked successful results with the experience of two practitioners in England, who solely relied for two and a half years on the efficacy of the oral method, were published. Another authority reports nine cases out of 6,506 children exposed to the infection when given the same way. Injection, if possible, to be insisted on for attack of acute faucial or laryngeal cases. The Chairman of the Melbourne Board of Health (Dr. Ham) has stated that a Melbourne firm will offer this serum in a palatable form for 1s. 6d. per dose, against 5s. to 7s. per injection.
8. Attention to the school-room from every point of view of hygiene, and sanitation, if need be, &c.
9. During epidemic to dispense with medical certificates and accept parents' reasonable excuses; infected children being freely sent to school to escape the law or cost of obtaining certificate.
10. Expenses of such treatment to be partially borne by the Government, Shire Council, or Municipality; or additional grant to approved bacteriologist, conditional to Board of Health requirements.
11. Cultures of staphylococcus to be used as anti-bacterial.

It was recently stated by Dr. Ham that carriers could be treated by anti-diphtheritic serum, but I fail to agree. The anti-toxin only does good in minimising or checkmating any symptoms of nerve or other lesion that should arise if an attack supervened. There is no protection in the blood serum against the toxin that must be constantly elaborated in the throat. In short, the serum is anti-toxic, not anti-bacterial.

At Fairfield Infection Disease Hospital, convalescents, I am informed, have been detained for some months on the expectation of negative swabs resulting after very large doses of anti-toxin and other local remedies. Such treatment ends always eventually in disappointment—the patient has at last to be discharged, possibly with true bacilli harboured in the throat.

Page (*Archives of International Medicine*), whose treatment is condensed in the *Australian Medical Journal*, 21st July, 1911, reports favourably on the use of staphylococcus culture.

Page's case was a girl who showed a positive culture after infection. The bacilli were tested by inoculation into guinea-pigs, and Page insisted that it should always be done.

The patient's throat was sprayed with bouillon containing a culture of staphylococcus pyogenes aureus, and this was repeated

every two hours during the day. The next day spraying continued. On the second day, cultures positive; the following day, cultures all negative.

Since reading Page's experiment, I thought it would be interesting to try and repeat it. I therefore took throat and nasal swabs from the carriers "Jack X" and "Norman Z," and from a family of four who suffered from diphtheria during the epidemic. These swabs were taken five months after the outbreak had disappeared, and the bacteriological examinations were made at the laboratory of the Melbourne University. The result of this examination showed carrier "Jack X" still positive, and one of the four cases tested to be still positive. The other three were negative, also the other carrier. I then obtained from Dr. Bull, Director of the Department of Bacteriology, twenty-four hours' culture in broth of *staphylococcus pyogenes aureus*. With this I sprayed the throats of the two effective carriers, after having first assured myself by personal experience that no unpleasant after-results were likely to follow. The spray was used on two occasions, with an interval of two to three days. Several swabs taken from carrier "X" sixty hours afterwards were negative; and again were further swabs taken five days from first spraying, when the presence of one bacillus was detected.

The second patient showed negative cultures after forty-eight hours, and a further examination two days later showed same result.

So far as the experience goes, it appears to entirely support Page's observation, and I believe it to be the first trial of this method yet made in Australasia, and one that seems worthy of more attention, as it is simple and easily applied.

The presence of a bacillus may be accounted for by the fact that the spray possibly did not reach the postero-inferior part of the enlarged tonsil where a swab was taken from.

NOTES ON DIPHTHERIA.

By W. F. LITCHFIELD, M.B. (Syd.).

I WISH, firstly, to say a few words about malignant diphtheria. Malignant diphtheria is characterised by the extensive formation of membrane on the tonsils, palate, and naso-pharynx, foul breath, nasal discharge, great swelling in the neck, rapid pulse, severe prostration, albuminuria, hæmorrhage under the skin and mucous membranes, followed by heart weakness and paralysis.

More is to be said about these cases, however. One feature is that they are severe from the beginning, and to get the best results it is necessary to recognise the condition early, even before the membrane has formed. The first symptoms are prostration, rapid pulse, sore throat (which may not be severe), and a foul breath; there may or may not be false membrane in the throat, and the raucous may appear congested or œdematous.

A little time back I was called to see a girl, aged 7 years, at 9 p.m. She had been ill since the morning, was prostrated, restless, and the pulse rate was 140; she said her throat was sore. The only positive symptoms was a very foul breath, the fauces were pale and œdematous looking, and there was a spec of false membrane, about the size of a pin's head, on one tonsil. I diagnosed malignant diphtheria, and administered 30,000 units of anti-toxin. Next day there were large patches of membrane on the throat and some swelling in the neck, but the breath was less foul. She was given another 10,000 units of anti-toxin, after which she rapidly improved, the throat being clear in three days' time. This case illustrates another point in dealing with malignant diphtheria, namely, that the first effect of an injection of anti-toxin is to increase the local reaction, namely, the swelling in the neck and the amount of membrane in the throat. It would appear in some cases that the poison is so severe that there is local death without reaction; and, in my experience, the worst cases are those in which there is a black-looking slough in the throat, without swelling in the neck. Albumen is not always present in the urine in the first two or three days, and if the case be vigorously treated with anti-toxin, none, or only a trace, may appear; but as a rule, in malignant diphtheria there is a considerable amount of albumen in the urine. The degree of albuminuria gives some idea of the amount of damage done to the tissues, and the likelihood of heart failure and paralysis developing later on. The foul breath is an indication of gangrene of the superficial tissues of the affected parts, but it is curious that at first this may occur without much change in appearance. I should say that severe prostration, a rapid pulse, and a foul breath in a child in whom an examination shows nothing else should be treated for malignant diphtheria. If there be membrane in the throat, swelling in the neck, or a nasal discharge, there need be no doubt. In ulcerative stomatitis the breath may be very foul, but here the gums are spongy and ulcerated.

The only effective treatment is by large doses of anti-toxin, and portion of this should be injected intravenously. The initial dose should not be less than 40,000 units. The largest dose I have given was 170,000 units, spread over forty-eight hours, 40,000 of which was given intravenously. The child recovered, and, as far as I could judge, needed all the anti-toxin he got. Restricting the term to the severest forms and using these large doses of anti-toxin, I reckon we save over 50 per cent. of our hospital cases of malignant diphtheria. Three months' rest in bed lying down is necessary after an attack of this form of the disease. With regard to other forms of treatment, we always give hypodermic injection of strychnine until the pulse regains its tone; brandy in moderate doses is also given as a routine; the diet is light and nourishing.

I wish, next, to say a few words about retained intubation tube. Intubation is now done as the routine operation for laryngeal diphtheria at the R.A.H.C., Sydney, as, for hospital work, it has been found to be more suitable than tracheotomy. The chief drawback to intubation is the occurrence in a proportion of the cases

of retained intubation tube, *i.e.*, the inability of the child to go without his tube after a reasonable time. At first we had a good many cases of this trouble, but latterly very few have occurred. During the last two years, of a total of 180 intubation cases only four cases had the tube in longer than twelve days. Of these, one went twenty-five days, one fifteen days, one sixteen days, followed by another five days with a tracheotomy tube; the other case wore the intubation tube for thirty days, was then tracheotomised, and died thirty-eight days later of pneumonia. So there was really only one incurable case during the period. The better results obtained by us of late years I attribute to the use of as small a tube in each case as can be done with. From observation I came to the conclusion that the lesion in retained intubation tube was in the region of the cricoid cartilage. In one case of stenosis I found post mortem a definite stricture in this region; in another case of stenosis operated on by Dr. Clubbe, a stricture through which a probe would not pass immediately opened out when the cricoid cartilage was cut through. The later case was intubated with a fair-sized tube, and after a short time was able to do without it. The narrowest part of the trachea is at the cricoid cartilage, and here there is a complete hard ring, and so it is easy for the tissues to be damaged if too large a tube be inserted. I take it, in retained intubation there is a bruising of the tissues in this region, which is very prone to tumify when the tube is removed, and which may actually lead to a fibrous stricture.

The sequence of events in retained intubation tube varies. As a rule, when the tube is coughed up or pulled out the child will go some little time without needing to have it put back; at other times the obstruction comes on with dangerous suddenness. Sometimes the child will go for some hours, or even days, and then suddenly or gradually develop urgent dyspnoea. One prolonged case we had would go as long as two weeks without his tube, the obstruction gradually increasing towards the end of the time. In his case there was a stricture which, when dilated, used to gradually close again. He ultimately got well. An important feature of retained intubation tube, when repeated endeavours are made to leave it out, is that the child gets into an exhausted condition; the child loses flesh and tone, and the heart becomes weak. Two of our early cases died suddenly of heart failure after getting into this state.

In regard to treatment, the first thing to remember is never to use a larger tube than can be done with, even though the smaller one gives some trouble by being coughed out occasionally. An attempt should be made about the third day in an intubation case to dispense with the tube; if the tube has to go back, successive daily attempts may be made for a few days to leave it out. If still unsuccessful, the attempt may be made every second or third day. These attempts may be persevered with, keeping to the smallest possible tube for some weeks if the child does not show signs of exhaustion. If the latter occurs it is better to do tracheotomy, and leave the tracheotomy tube in until the child regains its strength, when the intubation may be tried again. When a stricture occurs I think a high

tracheotomy, with a division of the cricoid cartilage, followed by immediate intubation with a fair-sized tube, the best practice. Of four cases of stricture of the subglottic region, all of which occurred some years ago, one died, one was cured by prolonged intubation, one is wearing a tracheotomy tube and will not submit to further treatment, and one was cured by the above method as already mentioned. Even in a case where there is no stricture, I do not see why division of the cricoid cartilage should not be tried if the condition exists after a reasonable trial of rest by tracheotomy, followed by reintubation. The method of continued intubation with increasing sizes of tubes, as recommended by some American writers, seems to me wrong in reason, for it can only result in more damage to the tissues lining the cricoid cartilage.

Now, a few words on retained tracheotomy tube. From observation on several cases of retained tracheotomy tube some years ago, I came to the conclusion that the trouble is due to a paresis of the abductor muscles of the larynx. In the cases observed by me the expiration and voice were good, but inspiration was blocked or ensued with a crowing sound; in other words, there were the symptoms of an abductor paralysis of the larynx.

My theory is that owing to disuse of the larynx while the child is wearing the tracheotomy tube there is over-action of the adductors and a stretching of the abductors, with a consequent weakening of the latter. The chief abductor is the posterior crico-aretenoid muscle, which rises from the back of the cricoid cartilage, comes over the rim of the latter, and is inserted by a long tendon into the aretenoid cartilage. It thus lends itself readily to over-stretching. Intubation cures these cases, and does so, in my opinion, by relaxing the abductor and allowing it to regain its tone. I remember one case that resisted all efforts to leave out the tracheotomy tube for several weeks; he was intubated, and coughed the tube out next day, with the result that he could subsequently breathe quite freely through his larynx; the tracheotomy wound was bandaged up firmly, and he never looked back. It is hard to understand a result like this other than on the theory stated above. Of five or six cases of retained tracheotomy tube that I have been associated with during the last few years, all have yielded promptly to intubation. Care must be taken, of course, that a too large intubation tube be not inserted, or the added complication of a retained intubation tube may result. Retained tracheotomy tube usually occurs in those cases where the tube is left in for several days without being removed, or where early and intelligent efforts are not made to get the child to use his larynx; but it will sometimes occur in spite of every precaution.

Lastly, I wish to offer an explanation of the peculiar distribution of the paralysis that follows diphtheria. The facts may be briefly stated as follows:—After diphtheria, from a few days to a few weeks, paresis of certain muscles is very prone to occur. Roughly speaking, the muscles are affected in the following order, both as to frequency and the time after the attack:—The heart, the palate, the ciliary muscle of the eye, the muscles of deglutition, the muscles of

respiration, the lower limbs, the trunk, and lastly the arms. Pathologically fatty and granular degeneration of the effective muscles occurs; degeneration of the nerves supplying the muscles has also been described. It will be noticed that the muscles most often affected, namely, the heart, the palate, the ciliary muscle, the muscles of deglutition, and the muscles of respiration, are muscles that are automatically or reflexly continually in action. My theory is that the diphtheria poison attacks muscular tissue either primarily or secondarily to injury to their nerve supply, and that degeneration takes place under stress of function. This would explain why the muscles most constantly in action are most prone to be paralysed; it would explain also why there is an interval between the period of poisoning and the occurrence of paralysis; also why paralysis of the lower limbs is more likely to occur in those patients that get up too soon. Another thing to notice with regard to the palate and the eye is that the palatal muscles and the ciliary muscle are thin strips of muscular tissue with little reserve power, and if injured might be expected to quickly succumb under stress of function. The theory at least forms a good working hypothesis, and should help the student to remember what muscles are most frequently paralysed after diphtheria.

“ON THE ORIGIN OF MURMURS DUE TO RHEUMATIC HEART DISEASE IN CHILDHOOD.”

By J. MACDONALD GILL, M.D., M.R.C.S.

IN the *Australasian Medical Gazette*, March, 1909, and January, 1911, I published two papers on the “Presystolic Murmur.” In the first of these papers I made the suggestion that this murmur was really due to a series of contractions of the left auricle; in other words, that the vibrations had a muscular, and not a mechanical, origin. In the second paper I published tracings from several cases, confirming and extending my first suggestion. I then showed that a similar explanation could be given of other murmurs besides the presystolic. I now wish to discuss the mode of origin of murmurs occurring in acute rheumatism, particularly as seen in childhood.

It is necessary, first, to describe what murmurs are usually heard; and then to discuss the explanations generally given of them. In a fair number of cases there is no murmur; in others a murmur will disappear; again, a child will go through an attack of rheumatism without a murmur, to come under treatment later on with well-marked murmurs. It is clear, then, that although murmurs occur in the majority of cases of acute rheumatism, absence of murmurs does not show that the heart is healthy. This is important in practice, as one should never tell the parents of a child that the heart is normal, after an attack of rheumatism, because there are no murmurs. One may probably take it as a fact that in every case of rheumatism in childhood the heart is affected more or less. But the difficulty is to know what rheumatism really is, the clinical signs

often being very slight and indefinite. The most common murmur is, of course, the systolic, usually loudest at the apex, but often heard over a large part of the chest-wall. The next most common murmur is the diastolic. This murmur is generally soft and blowing in character, of about the same intensity throughout, or diminuendo, usually strictly limited to the apex, and often very faint. It is almost always associated with a systolic murmur, and not infrequently with a doubling of the second sound. This murmur is very similar in character to the mid-diastolic murmur so often heard in adults with mitral stenosis. It is sometimes best heard at the base, and not at the apex. A presystolic murmur is rarely heard in children. My youngest case is a girl of 14, admitted to hospital for rheumatism, the first attack of rheumatism occurring when she was 9 years old. During the period covered by this inquiry, about four years, I have not come across a case with the presystolic murmur in the Children's Hospital. During the same period I have seen scores of such in adults. In addition to these, a confused rumbling or churning sound can often be heard at the apex in cases where the heart is much hypertrophied. This sound is continuous during the whole cardiac cycle, and gives one the impression of arising at a deeper level than the other murmurs. In one case a continuous tingling sound only could be heard over an area about half-way between the nipple and the left sternal border. In this case the apex-beat was far outside the nipple line, the heart being much hypertrophied; no other murmur was present. In another case of rheumatism in a girl of 13, a systolic murmur at the apex was audible on admission, but was replaced shortly afterwards by a continuous tingling sound internal to the nipple, to be followed a few days later by a systolic apex murmur similar to that first heard; when the tingling sound appeared the systolic murmur disappeared. In this case there was little, if any, hypertrophy of the heart. None of my cases of acute rheumatism have shown murmurs which could have been due to aortic valvular disease. I have records of two cases of aortic regurgitation from the Children's Hospital, but in both the valvular lesion dated from a previous attack of rheumatism. These children were admitted for the heart trouble, and not for rheumatism. It should be noted that in many cases in which a "to and fro" murmur can be heard at the apex we have really one murmur only, the diastolic portion of the murmur being due to the withdrawal of the apex from the chest-wall during diastole; that this is so is proved by the murmur having the same characters throughout. This description of the murmurs due to rheumatism in childhood is, of course, not complete, but includes all those that are at all common.

Usual Explanation.—The explanation most in favour at the present time is that these murmurs are due to dilatation of the left ventricle. The systolic murmur is due to weakness of the muscular tissue surrounding the mitral orifice; it cannot be due to valvular defect, as there is rarely sufficient injury to the mitral valve to cause incompetence, judging from *post mortem* evidence. As a rule, in fatal cases the mitral valve is perfectly competent. It is therefore usually supposed that

the powerful contraction of the left ventricle dilates the mitral ring, so as to allow of regurgitation taking place. On the other hand, the diastolic murmur is said to be due to dilatation of the body of the ventricle, the mitral ring remaining of the usual size; or, in other words, due to a relative narrowing of the mitral orifice as compared with the body of the ventricle. This theory is necessary, as actual mitral stenosis is rare in childhood. The weakness of these explanations is obvious. It is unreasonable to suppose that the ventricle is so accommodating. Moreover, they do not explain those cases with a continuous rumbling or tingling sound. It is clear that any merely mechanical explanation is unsatisfactory. It is, further, an error to suppose that dilatation of the left ventricle necessarily accompanies rheumatic heart-disease; and when it does occur there is often no murmur, systolic or diastolic. Children with murmurs, systolic and diastolic, may go about for a long time without any inconvenience whatever, and without any evidence of dilatation of the left ventricle.

Own Explanation.—The real explanation, I believe, is that given in my former paper, viz., that there is a rapid continuous vibration of muscular origin in all these cases, often easily recorded by placing the receiver of the polygraph over the situation of the right ventricle—that is, over an area well inside the left nipple, between it and the left border of the sternum. These movements are often very delicate, and are readily obliterated by pressure. They occur at a rate of about ten per second. Very often there is little or no sign of them in a tracing of the apex-beat. They can only arise in the right auricle. A case (Fig. 1) of heart-block from acute rheumatism well illustrates these remarks. A boy, aged 10, was admitted to hospital for a severe attack of rheumatism. After the temperature had fallen to normal he was found to have a slow pulse. A jugular tracing was taken, and showed complete heart-block; the radial pulse was 50; the right auricle contracted regularly at a rate of about 90. The right and left ventricle beat synchronously as shown by the jugular pulse and by the X-rays. A tracing taken from the apex-beat, which was quite an inch outside the nipple line, showed a normal cardiogram, with no sign of the “S” waves. A curve taken from an area between the nipple line and the left sternal border showed the “S” waves most distinctly. We thus have records of the two ventricles and the right auricle. We may safely assume that the left auricle beat synchronously with the right. We are thus driven to the conclusion that the little waves in the cardiogram from the right ventricle are due to the movements of the sinus tissue in the right auricle. These sinus waves are apparently regular, and are continuous during the whole cardiac cycle. In this boy a record of the sinus movements could always be obtained with the greatest ease. There was never any murmur, systolic or diastolic.

Another case of heart-block (Fig. 2) in a child has come under my notice. This child was the subject of congenital heart disease, and died suddenly when about 5 years of age. Shortly before death I obtained this cardiogram, which shows the “S” waves clearly

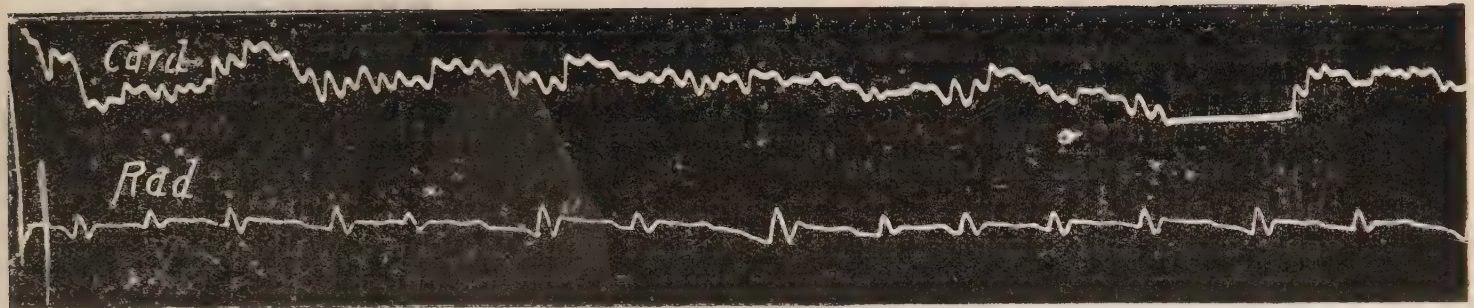


Fig. 1.

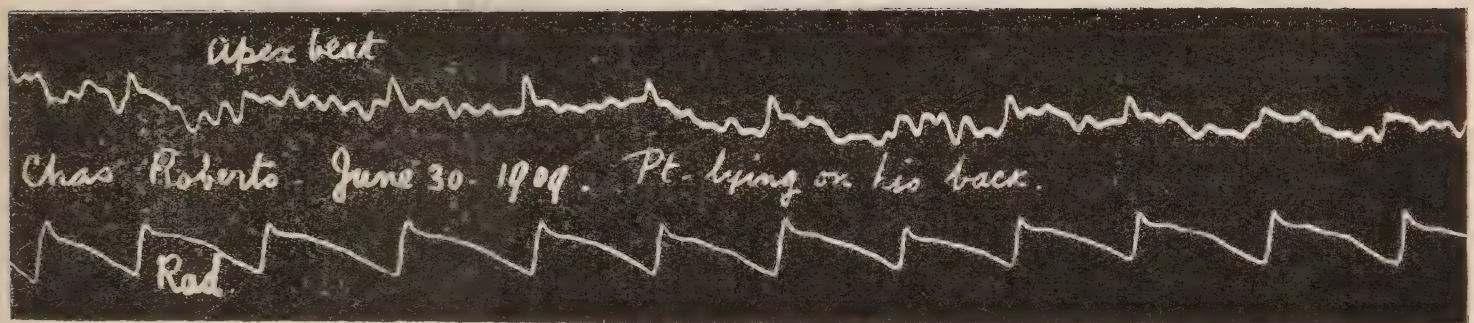


Fig. 2.

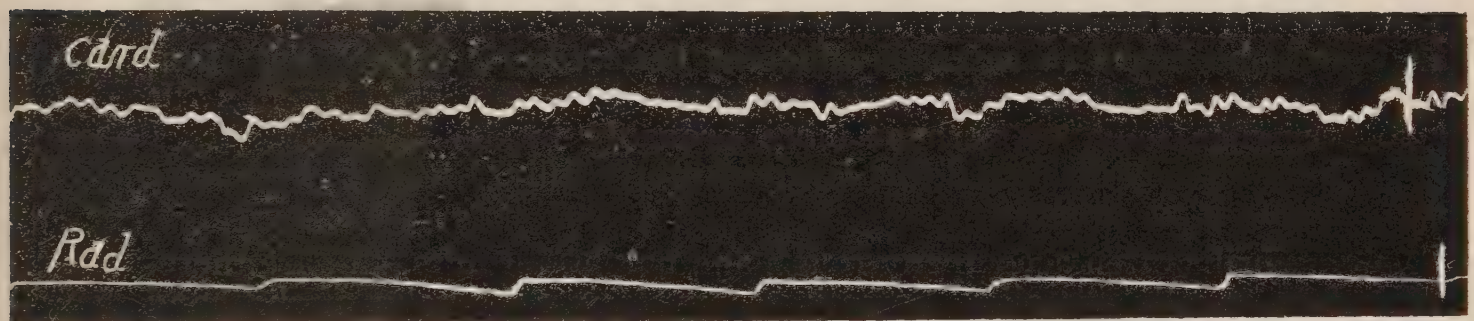


Fig. 3.

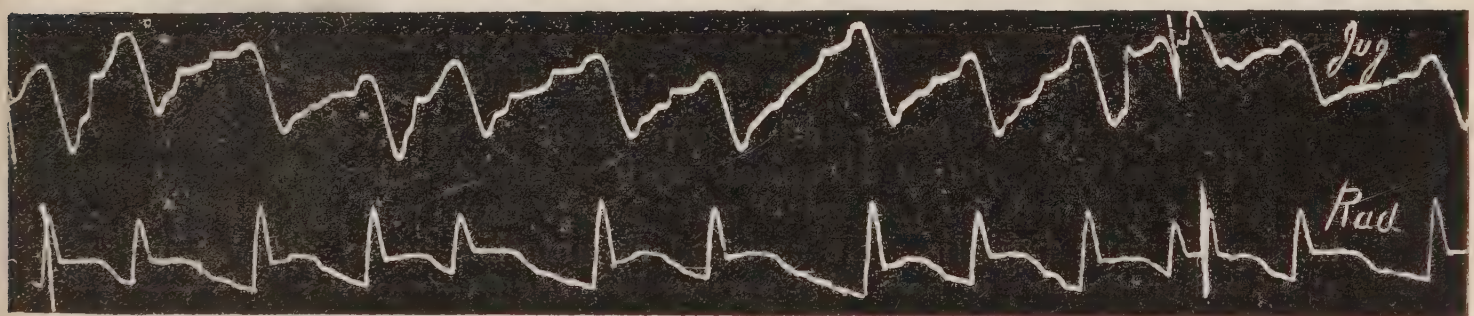


Fig. 4.

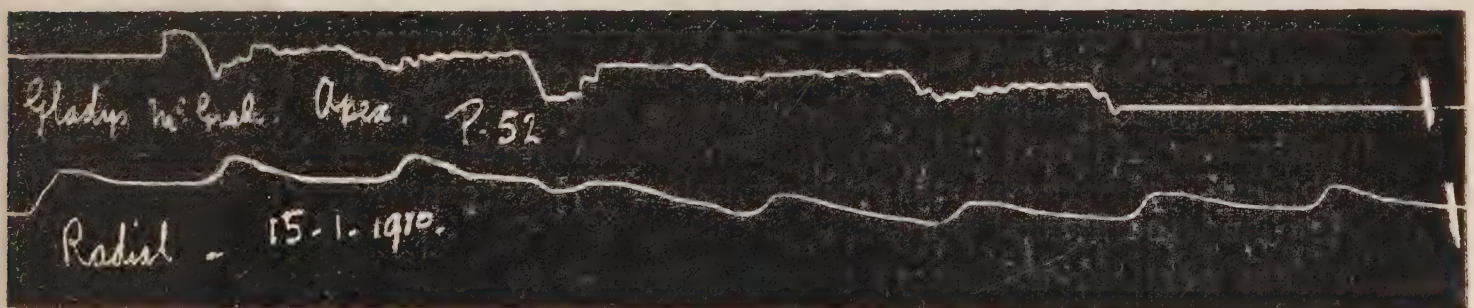


Fig. 5.

enough. There was no murmur. (The case has been reported in the *Australasian Medical Gazette*, June, 1911.) I have obtained records of these "S" waves in many other cases of rheumatism, both in children and adults. It is now easy to understand how murmurs may arise in rheumatism. The vibrating tissue, probably chiefly situated between the openings of the superior and inferior venæ cavæ and coronary sinus, is remote from the chest-wall. Any vibrations producing a murmur must reach the chest-wall. The connecting link between the two is the right ventricle, perhaps chiefly the inter-ventricular septum. During diastole the muscular tissue would be too flaccid probably to transmit these vibrations at all readily. During systole the ventricular tissue becomes more rigid, and therefore better able to transmit vibrations, and comes much more intimately in contact with the chest-wall. Hence it is that murmurs are most commonly systolic, whereas diastolic murmurs are much fainter. The continuous tingling or rumbling murmurs are now easily understood.

The presystolic murmur, as I suggested in my former papers, probably arises in the left auricle. The sinus remains in the left auricle are apparently situated at the mouths of the pulmonary veins. The presystolic murmur implies hypertrophy of the left auricle. This probably takes time. Hence a presystolic murmur may be heard in cases of adherent pericardium, as well as mitral stenosis. I think that it is transmitted to the apex by the left ventricle only, or perhaps more probably by its contents. As I have already discussed this murmur pretty fully, I need say no more about it at present.

Thrills often accompany rough and harsh murmurs, and are therefore usually systolic. Sometimes by placing the palm of the hand flat on the precordial area, and getting the child to sit up and lean forward, one can make out that the thrill is really continuous throughout the whole cardiac cycle. Thrills in the vessels of the neck are rare in rheumatism, but are common in congenital heart disease, and were well marked in one of my aortic cases.

These vibrations (Figs. 3 and 4) were well shown in a man aged 22 years, in the Sydney Hospital, with a slight degree of heart failure, from which he recovered after a few days rest in bed and treatment with digitalis. He had had rheumatism at 10, and again at 14, when he was in bed with pericarditis for five months. Since then he has been fairly comfortable and able to get about. The heart was much hypertrophied; there was a prolonged systolic murmur at the apex, but no thrill. The pulse was continuously irregular. Venous pulsation was well marked. A tracing showed the auricular fibrillations clearly enough, but nothing like so clearly as the cardiogram. The apex-beat curve (not reproduced) gave no indication of the "S" waves. The cardiogram shown here was obtained from the usual position half-way between the left nipple line and the sternal border.

The next curve (Fig. 5) is from a boy of 15 years, who had had rheumatism at 6 years and again at 14. He has a double aortic

murmur at the base, and a systolic murmur at the apex, where there can also be heard an indefinite rumble, loud, strictly limited to the apex, just preceding the first sound and during it; away from this the systolic murmur is clearly audible. The pulse is regular, and the venous pulse gives a normal curve. This cardiogram was taken from the apex with the boy lying on his back. Similar vibrations are shown as in the other cases.

The next case is a girl of 12 (curves not shown), who died in the Children's Hospital after a prolonged illness. There was no definite history of rheumatism, but there could be but little doubt that the cause of the heart condition was rheumatism. She had been in the hospital for the greater part of two years. She suffered from the usual symptoms of chronic heart failure, shortness of breath, ascites, for which the abdomen was tapped more than once, &c. The pulse was always regular till about a fortnight before death, when it became irregular, and remained so till the end. The venous pulse was well marked, and I got several tracings when she was well enough to lie down. When the pulse became irregular the difficulty of breathing was such as to prevent a record of the venous pulse being taken. The heart was much hypertrophied; there was a loud systolic murmur audible over almost the whole of the chest, back and front; at the apex, and limited to it, there was a loud continuous rumbling sound, as in the other cases. The jugular curve shows one wave only synchronous with each radial beat; there is no sign of an auricular wave, but there are faint evidences of auricular fibrillation. The cardiogram shows the "S" waves very well. At the post-mortem examination there were soft pericardial adhesions, easily torn by the finger; no adhesions to the chest-wall. Both ventricles were considerably hypertrophied; the walls of the right ventricle were nearly as thick as those of the left. The mitral valve contained some firm fibrous nodules, but was not deformed; the two flaps came together well, and the valve was perfectly competent. The other valves were competent. The right auricle was much dilated; the muscular structure looked healthy to the naked eye, and it was obviously much hypertrophied; all parts of it seemed to share in the hypertrophy, the pectinate fibres being two or three times as thick as normal. In this case it was impossible to suppose that there had been any regurgitation through the mitral orifice. Nor was it possible to ascribe the hypertrophy to the pericardial adhesions, which were evidently fairly recent. The hypertrophy is due to a vital and not a mechanical cause. It is reasonable to suppose then that the sinus would contract with greater vigour, which would naturally lead in time to hypertrophy of the heart. The greater vigour of contraction is necessary, because of the damage done to the cardiac musculature by the rheumatic poison. It is important to realise that hypertrophy is a common consequence of rheumatic heart infection, apart from any mechanical cause. (My observations on the pathological anatomy of rheumatism are too few to be of much value, but a careful summary of recent work may be found in a paper in the *Quarterly Journal of Medicine*, October, 1908, by Carey Coombs.)

Aortic and Pulmonary Murmurs.—Aortic murmurs are rarely present as an immediate result of rheumatism, though common enough, of course, in adults who have had rheumatism in childhood. On the other hand, a pulmonary systolic murmur is often present, but having no pathological significance, little attention is paid to it as a rule. Aortic and pulmonary murmurs are, in my opinion, produced in a similar way to the so-called mitral murmurs. In suitable cases, continuous vibrations can readily be recorded. What is really necessary is a dilated aorta or pulmonary artery. When the aorta dilates and stretches, it tends to come forward to the right; this is what actually does happen in cases of aortic insufficiency. An aortic systolic murmur is often heard in elderly people; and a “to and fro” murmur occasionally, apart from any valvular defect. On the other hand, there may be a marked valvular defect, without any murmur, systolic or diastolic. As an acute condition, this can only occur as a result of ulcerative endocarditis. That murmurs are often absent in cases of primary septic endocarditis is well known and universally acknowledged.

In aortic aneurisms murmurs are usually absent, unless the aortic orifice be affected. During the period covered by this inquiry—about three and a half years—I have examined several cases of aneurism of the thoracic aorta, in which the aortic orifice has been normal, and none of them has had a murmur, although in some there was well-marked visible pulsation. If the “fluid vein” theory of the origin of murmurs be generally true, then a murmur should always be present.

I shall now discuss the murmurs audible in the pulmonary area. The systolic murmur of chlorosis is easily explained, as the pulsation so often seen in this area is now universally admitted to be due to dilatation of the infundibulum of the right ventricle; I succeeded in one case in obtaining a record of the continuous vibrations (recorded in January paper). In this situation one occasionally comes across murmurs similar to those heard in arterio-venous aneurisms—*i.e.*, a continuous “humming-top” murmur, usually accompanied by a thrill, traceable upwards to the left clavicle, but not downwards to the apex. I have had two such cases during the last two years. In both cases the murmur was discovered accidentally, the one being a young woman of about 21, in hospital for a surgical affection; the other a boy of 15. Neither had any symptoms referable to the murmur, and both were well grown. In the woman I succeeded in getting an imperfect record of the continuous vibrations; but the boy’s chest was too well covered by muscle and fat to permit of a record being obtained. This murmur is generally attributed to a patent ductus arteriosus, but an exactly similar murmur may be heard with simply a dilatation of the pulmonary artery. This is a well-established fact, about which there is no question. A considerable dilatation of the pulmonary artery is always a result of a persistent ductus, if the patient lives long enough. Of the many cases of congenital heart disease in children which have passed through my hands during the last three and a half years, not

one has presented this murmur. It is, therefore, clear that the murmur is not dependent upon a patent ductus arteriosus, but upon the consequent dilatation of the pulmonary artery. It is well known to those who have made a special study of the murmurs of congenital heart disease that this murmur is generally absent in children with persistent ductus arteriosus, though generally present in adults similarly affected.

I hope that I have made it clear that a new explanation of these murmurs is absolutely necessary; and that we now have before us a simple, clear, and satisfactory solution of the problem.

TREATMENT OF SPASTIC PARALYSIS.

By MAX HERZ, M.D.

Two spinal tracts secure the smooth working of a muscle contraction. The impulse of the will is sent along the pyramidal tract which runs from the pyramidal cells of one hemisphere to the spinal centre in the anterior horn of the opposite side of the cord. The messages and orders despatched by that route find the spinal centres alive, active, and ready to answer the command at once. They are kept awake and busy by the constant influx of irritations coming from the periphery by way of the posterior roots. These sensations, running in the lower neuron, and forming the passage of the reflexes, keep the anterior horns, and with it the muscles, in a state of activity, which finds its expression in the tonus of the muscles, the slight general contraction which seems to make it ready for quick and smart work. The muscle contraction is commenced already by the tonus, so to speak; the action following the command of the will need only continue or finish a contraction already begun. To be in readiness is all—for the muscle, too. The posterior roots supply the necessary stimulus to the anterior horns; these stimuli are sensory sensations provided by irritation of the sensory nerves in the skin, in the muscles, the joints, bones, &c. But these peripheral sensory irritations are not always equal in strength, being sometimes weaker, at other times stronger; thus, left to themselves, they would cause a state of activity and vitality in the muscle centres far beyond that required for the normal work; they would amass, their power and number might overwhelm the muscle-centre, and the end be a continuous contraction of all muscles, varying only in degrees, which would make any muscle unfit for work. There remains, then, the necessity for control and checking. And these duties are performed by the inhibitory fibres in the pyramidal tracts,

which tend to extinguish the constant irritations and put down the weir, so that only so much can flow into the muscle-centres as is required for the upkeep of the tonus. This inhibitory action of the pyramidal fibres is like that of the vagus when it controls the work of the ganglia in the heart.

The disturbance of mobility, which characterises spastic paralysis, is brought about by two different components. The one is the paretic factor, which results from the interruption of the nerve tracts in the upper neuron, the cortico-spinal tract, and finds its expression in the disappearance or debility of the voluntary innervation of muscles. With other words: In the upper neuron, tracts, over which the will can send its messages to the muscles, are formed badly, or not at all. The other component is the spastic one. It consists of an exaggeration of the excitability by reflex of the muscles—that is to say, peripheral sensory irritations cause the muscles, by way of the spinal reflex, to contract abnormally, and powerfully. These reflexes can gain the upper hand in these cases, because the inhibitory fibres of the cortico-spinal tract, which normally control, weaken and suppress them, are out of action. Thus, in the upper neuron, in the cortico-spinal part, two tracts are either working badly or not at all—those which transmit the command of the will, and those which prohibit the overpowering action of the reflexes upon the muscles. The lower neuron has it all its own way.

The pathological exaggeration of the reflex excitability of the muscles presents itself in four different ways:—1. The reflexes of tendons and periosteum are increased, yielding now to the slightest touch (patella-reflex, foot-clonus). 2. We have the exaggerations of that combined reflex, called by Foerster the Abwehr-reflex. When the sole of a normal foot is irritated, the leg answers with a flexion of the hip and knee; it seems to withdraw itself from the irritation, and, for the want of another expression, I shall call it the withdrawal reflex. This is, in case of spastic paralysis, often so exaggerated that the slightest touch of the sole is sufficient to bring about an extensive flexion of hip and knee, thus making standing or walking a matter of impossibility, as every time the foot touches the ground and the sole is irritated the legs fly into the air. This movement sometimes comes rhythmically, apparently spontaneously, really as an answer to amassed irritations, and is most tormenting to the patient. Thirdly, we have, as consequence of the continuous reflex irritation, the spastic muscle contractions, which fix the limb in one position. The muscle, once spastically contracted, cannot be set free again; it keeps, it clings, to this state, and makes any movement in another direction a matter of impossibility. A knee stands bent, the flexor muscles are as hard as wire ropes, and an extension is *ultra vires*. Fourthly, conjoint movements will be always observed; one leg cannot be moved without the other; a foot cannot be flexed without bending at the same time the whole leg; one knee, one hip, cannot be moved without moving the same joint on the other side; each flexion of the forearm is combined with an abduction of the upper arm and pronation of the hand; head, body, arms are set in

motion if the legs are asked to act; in other words, the isolated movement of one limb, or part of it, is lost. Foerster has it that these conjoint movements are consequences of the greater reflex excitability. It would seem to me, however, that it is of central origin, and is an expression of the great mental strain and energy applied by the will to set the pyramidal cells in action; this energy flows over to other cells, to other centres, which thus are set in motion.

Now, it is happily so that even in the most severe cases of spastic paralysis all nerve tracts are not destroyed, but that a certain part has been preserved, and over these the will may reach the muscles and awake voluntary action in a small degree. That in most cases this voluntary action is not greater is caused by the existing spastic symptoms, especially by the muscle contractions and conjoint movements.

How, then, can these spastic symptoms be minimised? How may the exaggeration of reflexes be brought back to their normal standard? It is impossible to replace the controlling tracts in the upper neuron. Only the lower neuron offered itself. A little can be gained by tenotomies, as a lengthened muscle cannot develop that strength a short one possesses; but the relief is only small and temporary; the lengthened muscle will soon shorten again and resume its old sad role. Foerster, now, remembered the experience that in cases of lesions of the cortico-spinal tracts of the upper neuron, spastic symptoms are absent if the region of the posterior roots is destroyed also, and no sensory irritation can enter the spine. Thus he proposed to resect some of the posterior roots. As the cutting of all roots in question, first to fifth lumbar, and first to second sacral, would cause total anæsthesia, an artificial locomotor ataxia in fact, and as Sherrington has taught that the different sections of the body are all fed by three consecutive roots, Foerster made his selection thus: That only two neighbouring roots should be divided; the most useful method is that of resecting the second, third, fifth lumbar, and first and second sacral; in case of overwhelming flexion of L2, L3, L5, and S1, contractions of extensors are operated by division of L2, L4, S1, S2. In the upper extremity it is best to resect C4, C5, C7, C8, D1.

The operation is not a simple matter, and is naturally confined to severe cases, although in the four operations* which I have made we saw very little ill-effect. The shock was overcome playingly as it were, and there was very little pain. Our cases healed up by first intention without any disturbance.

The chief indications for this operation are the spastic paralysis caused by a lesion in the cortico-spinal tracts, be it congenital or acquired. Naturally a case in which the cause has ceased to act—congenital di- or hemiplegia, cerebral or spinal; spastic paralysis

* Up to the time of proof-reading (May, 1912) we have performed this operation seven times, all being successful.

after Pott's disease, healed out, after cured myelitis and traumatism—promises better results than progressive cases, as sclerosis multiplex, syringomyelia, syphilitic affection through endoarteritis, as here the progress of the original complaint may upset the good effect of the operation. The seat of the original complaint—the place where the cortico-spinal tracts have been interrupted—really matters little. A rest of voluntary movement is left in nearly all cases, especially in Little's disease, although it may be impossible, for instance, to prove that a quadriceps femoris is working whilst the flexors are in spastic contractions. A difference seems to exist between arms and legs, as the paretic component appears to be more pronounced in the upper extremity than in the lower; it is the musculo-spiral nerve which so often is not conducting the command of the will to the muscle. Where no voluntary movement is left at all no result can be looked for.

Foerster's operation in itself is not a cure. It creates only the foundation upon which the future results can be built. It procures the weakening of the exaggerated reflexes; the limbs become soft and pliable, especially if, as often necessary, the contractures caused by the shrinkage of muscles have been removed by lengthening the tendons. Sometimes it is possible to move the leg passively with great ease, whilst the active motion does not show that ease and extent. Here the after-treatment begins. And it is absolutely of equal importance as the operation itself. A child, operated upon and left alone, would never learn walking. It needs daily exercise, analytic exercise, practice of every movement and muscle, beginning with the simple ones and progressing to the more complicated. Balancing, standing, sitting, turning, walking in the frame with sticks; in short, every little movement has to be taught, practised, corrected. An angel's patience is needed; but most satisfactory results can be looked for. The conjoint movements disappear, so do the contractures; the progress is slow, often despairingly slow. It took nine months of exercise to get a boy of 10, who never walked or stood, to walk with two sticks across the room. Some patients find it exceedingly difficult to balance on their legs. And it takes time, time, time, and patience. The little boy I brought with me could balance and shuffle in the scissor-gait fashion through a room; he was operated upon six months ago, L2, L3, L5, S2 being resected on either side. His walk on a stick is almost normal; without support it is still a little shaky, but is improving quickly.

I have no doubt that Foerster's operation is destined to bring luck and light into the life of many unfortunates.

CHARTS OF INFANTILE MORTALITY.

By W. F. LITCHFIELD, M.B.

CHART 1 shows the relative birth-rates, death-rates, and natural increases of the Australian States and certain other countries per 1,000 of population.

The Australian States and New Zealand have the largest natural increase, and the chart shows that this is due to a very favourable death-rate, and not to a large birth-rate, which, as a matter of fact, is below that of most of the other countries mentioned. It is curious to note that the birth-rates and death-rates run more or less on parallel lines, though statisticians declare that there is no necessary connection between a high birth-rate and a high death-rate, or between a low birth-rate and a low death-rate.

Chart 2 shows the infantile mortality of the Australian States and certain other countries. Here, again, the Australian States figure favourably. An infant mortality under 100 per 1,000 births is very good, and it will be noticed that all the Australian States and New Zealand come well under that.

Chart 3 shows the infant mortality of New South Wales for each year from 1860 to 1909, and that for the metropolis of Sydney from 1880 to 1909. Several things in this chart deserve notice. One is that the infant mortality of New South Wales from 1860 to 1873 was lower than in the years immediately preceding 1904; another is the remarkable fall in infant mortality from 1904 onwards. A similar fall occurred in all the other States of the Commonwealth, and cannot be explained other than by some obscure climatic influence. The top line shows the infant mortality of the metropolis; and it, too, shows a similar fall from 1904. I have interpolated the dates when the sewer connection was started in Sydney, when the Dairies Supervision Act came into force, and when the present water supply was inaugurated. These, though possibly responsible for the diminution noted before 1904, show no immediate connection with the great fall in that year, when the infant mortality for the first time fell below 10 per cent. per annum.

Chart 4 shows the monthly infantile mortalities of the metropolis for the five years ending 1903 and for the five years ending 1909. Here it will be noted the fall already referred to has taken place chiefly in the summer months. This demonstrates fairly clearly that the fall in infant mortality during recent years is due, in the main, to a lessened mortality from diarrhoea, for it is that disease which causes the death-rate of infants to go up in summer.

Chart 5 shows the legitimate and illegitimate death-rates of New South Wales for the same two periods. Both classes show a great fall, and this has been slightly more pronounced in the case of illegitimate children.

Chart 6 shows the infant mortality of the various districts of New South Wales for ten years ending 1903 and for five years ending 1909, also the approximate rainfalls and mean summer temperatures

for the same places. Note, firstly, that every district shows a considerable fall in the second period; secondly, that, roughly, the infant mortality varies inversely with the rainfall; and lastly, that the mean summer temperature is high in all the districts, and there is no particular correspondence between the mean summer temperature and the infantile death-rate.

A study of the vital statistics shows that the excessive mortalities in the dry districts is due to increases in the deaths from diarrhœa, and it is interesting to note that the fall in infant mortalities in the later period has been greater in those districts than in the wetter ones, a circumstance pointing in the same direction as the monthly mortalities already depicted, namely, that the recent great fall in infant mortality is due to a decrease in the deaths from diarrhœal diseases.

CHART V.—Death Rates, Legitimate and Illegitimate, New South Wales under 1 year per 1,000 births.

							1899-1903.	1905-1909.
Legitimate	...	...	...	...	...	...	96.48	70.90
Illegitimate	...	...	...	...	...	...	278.67	183.07
Total	...	...	...	...	...	...	109.10	78.72

CHART VI.—Infantile Mortality, Rainfall and Mean Summer Temperature for Districts of New South Wales.

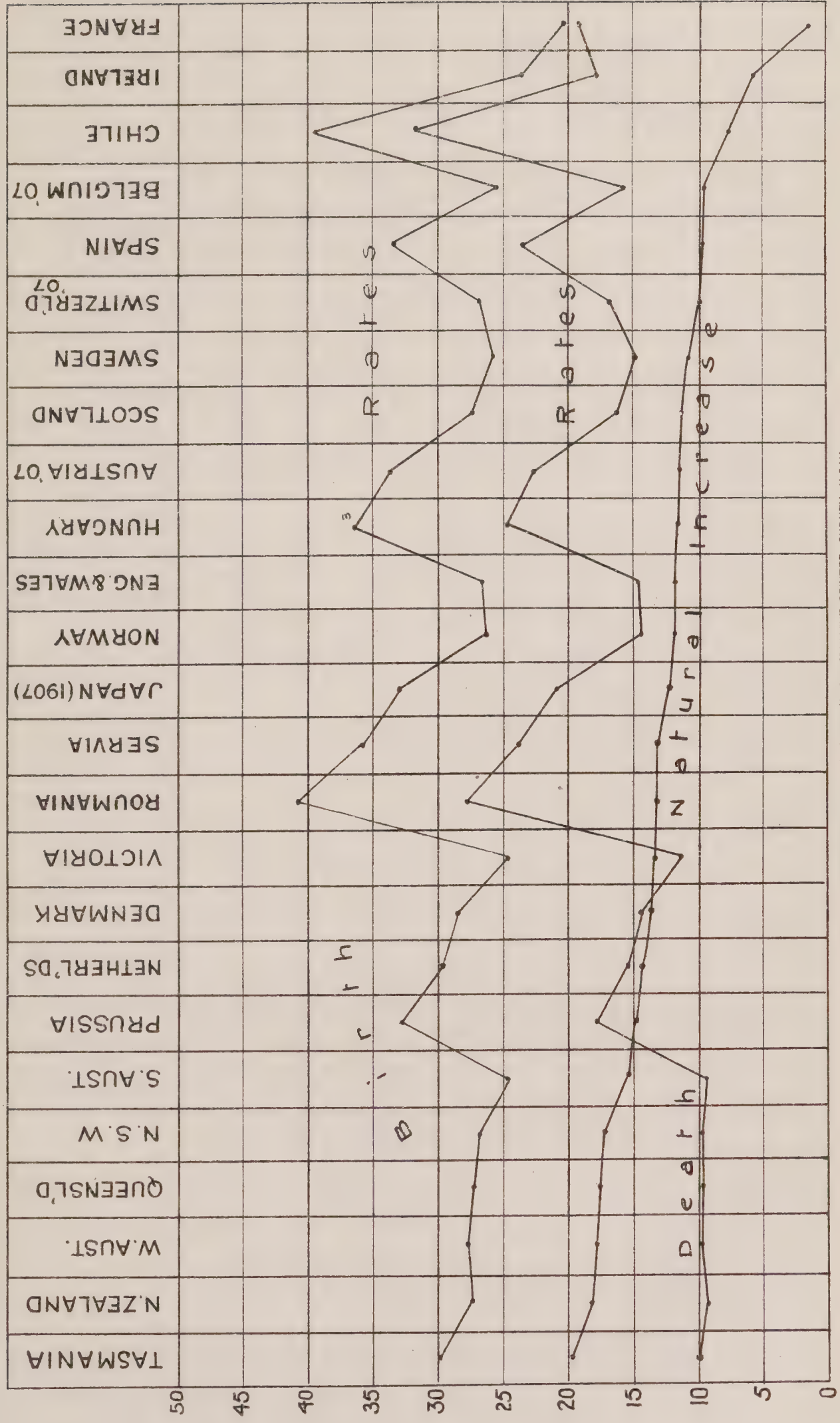
					Ten years ending 1903.	1905 to 1909.	Rainfall.	Mean summer temperature.
							inches.	
North Coast	...	...	...	...	65.3	54.8	56.7	76°
South Coast	...	...	...	...	75.3	64.2	38.8	68°
Monaro	...	...	...	...	79.4	58.2	20-60	65°
Gundagai	...	...	...	...	85.8	65.8	20-30	65°
Hawkesbury and Nepean	...	...	...	...	89.3	77.7	30-50	70°
Mudgee	...	...	...	...	90.5	76.3	25-30	73°
Murray...	...	...	...	...	95.9	65.2	13-30	70°
New England	...	...	...	...	97.2	66.9	25-35	67°
Bathurst	...	...	...	...	101.6	81.3	25-30	73°
Central Cumberland	...	...	...	...	104.2	94.2	30-40	70°
The Hunter	...	...	...	...	107.9	80.8	40.0	74°
Namoi and Gwydir	...	...	...	...	110.9	66.0	20.4	77°
Murrumbidgee	...	...	...	...	112.5	73.5	16.2	75°
Bogan	...	...	...	...	110.5	82.7	18.7	73°
Argyle	...	...	...	...	117.6	69.6	25-30	73°
Western	...	...	...	...	165.0	110.3	13.2	80°

Coast, 40 inches. Tableland, 29 inches. Coast Slopes, 21 inches. West, 13 inches.

BIRTH RATES, DEATH RATES & NATURAL INCREASE,

1908-1909 AUSTRALIAN STATES.

CHART I.



INFANTILE MORTALITIES (PER 1000 BIRTHS)

CHART II.

1906 - 1909

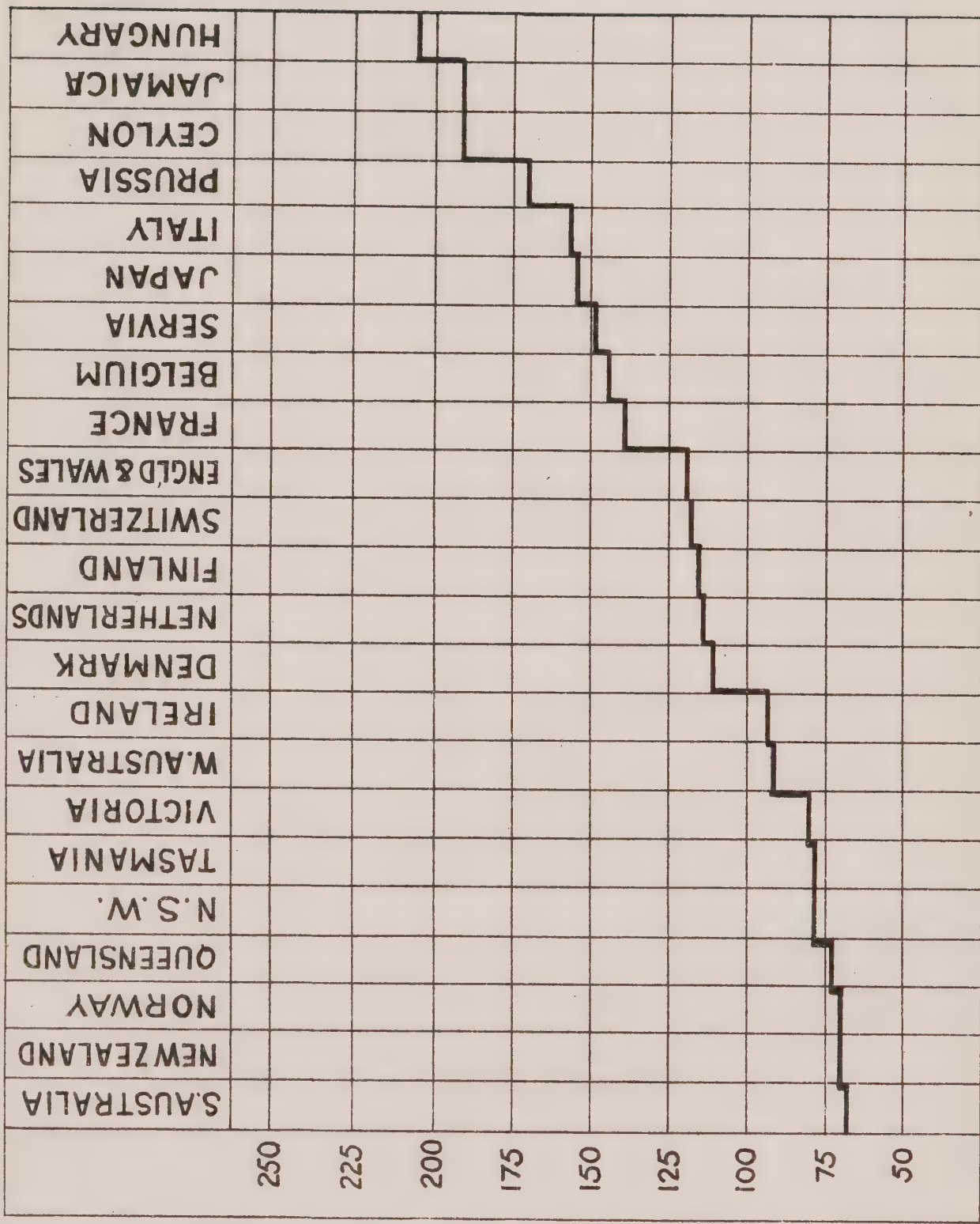
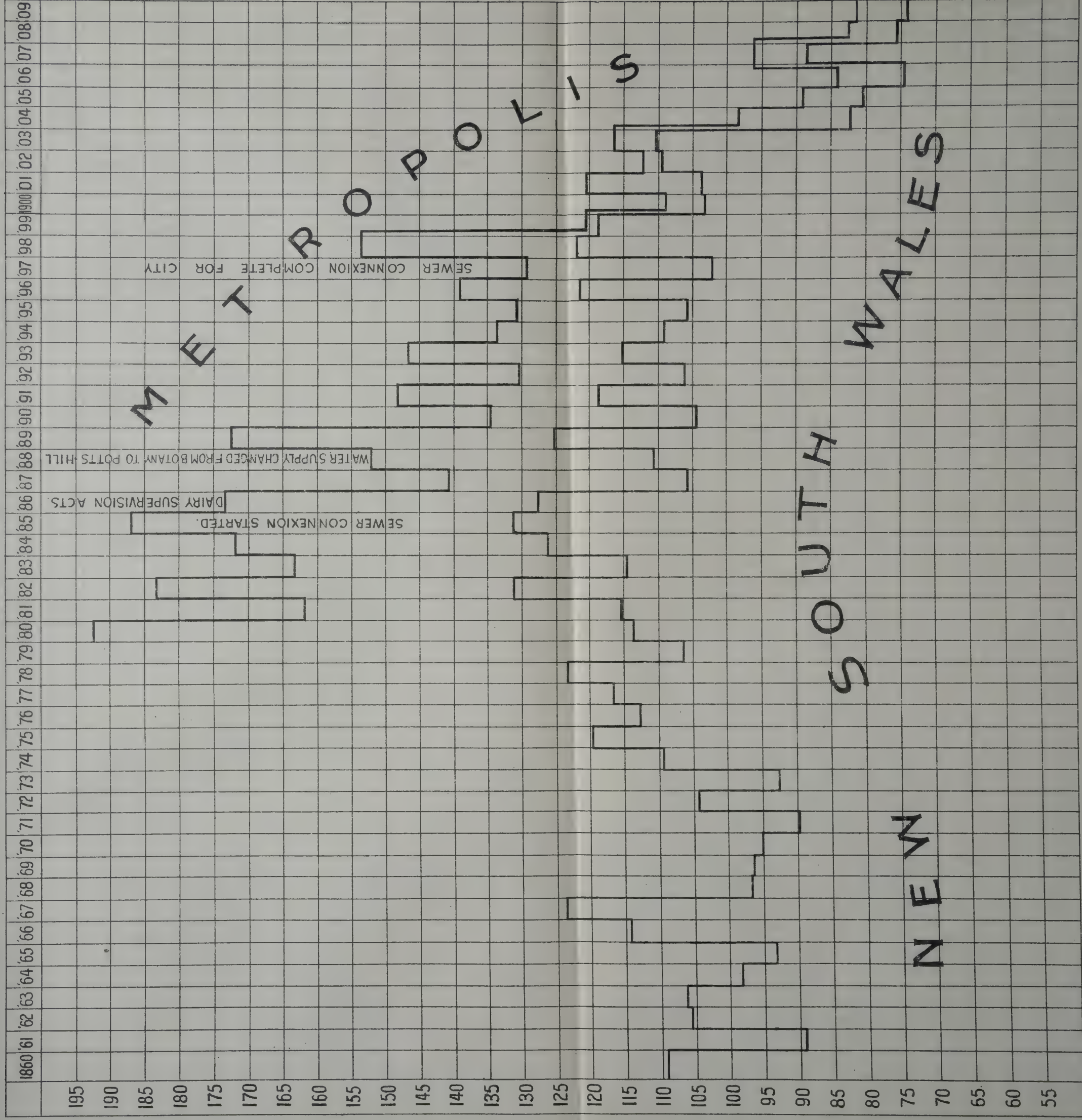


CHART III.

INFANTILE MORTALITY, N.S.W. & METROPOLIS.



INFANTILE MORTALITY (PER 1000 BIRTHS) MONTHLY. METROPOLIS

CHART IV.

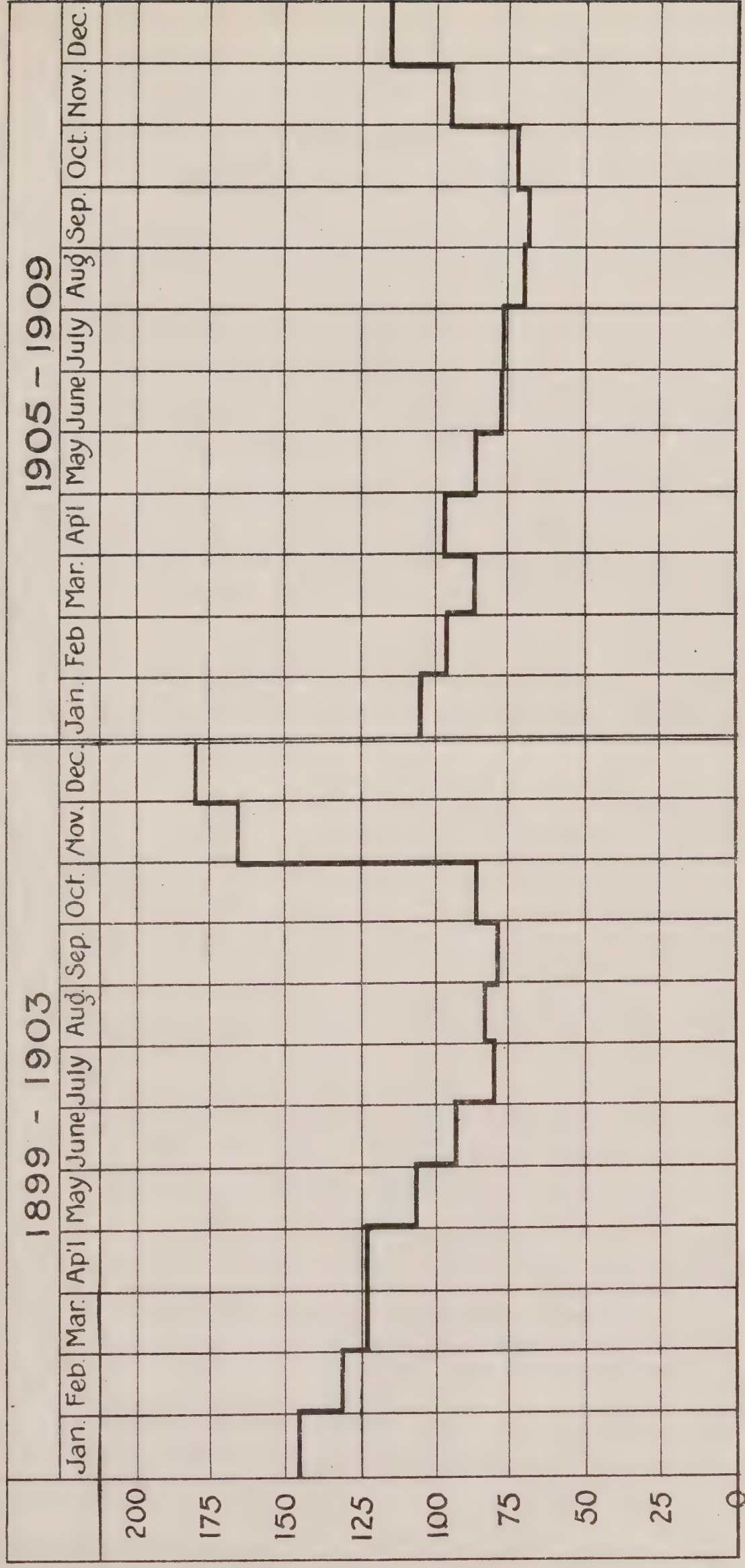


PHOTO-LITHOGRAPHED BY W. A. GULLICK, GOVERNMENT PRINTER, SYDNEY, N.S.W.

IDIOGLOSSIA.

By HARVEY SUTTON, M.D. (Melb.).

DURING the past two years I have met with twelve cases of the relatively little known condition of Idioglossia. Two typical cases were brothers about 9 and 11 years old. They were bright active youngsters, and had an older brother and sister, 17 and 14 respectively. The mother is an intelligent woman and alone understands their gibberish well. As a matter of prognosis, it is worth noting that both the elder brother and sister had, the mother states, exactly the same condition till about puberty. The boy is perfect now, the girl only fails over combinations of s, sp, st, &c.—e.g., stumble is called sumble; spit, sit. The prognosis seems therefore to be a favourable one. The previous history of parents and family contains nothing remarkable. Take the elder of the two boys, and ask him his name (Sam Thompson); he says Gāa-m Gāa-kn; if you repeat Gāa-m Gāa-kn after him, and say "Is that your name?" he shakes his head, but if you say "Sam Thompson," he nods in agreement; i.e., he fails to appreciate his own errors, though he can distinguish yours.

If we take out his alphabetical sounds his alphabet runs—āā, bee, kee, d, ee, eff or gāā, gee (hard), āā (h), aa (i), dāā (j), kaa, el, em, en, arve (=o), pee, koo, āā, āāve (r), ehs (s), kee (t), yew (you), vee, double oo, ek (x), waa (y), ged (z).

ā ē ě ĭ retained, ă ĭ ō ǒ lost.

His method of word formation seems to be as follows.—If the sound is one he cannot reproduce he replaces it by āā or gāā or k̄. Thus Sam Thompson (his own name) = S ă m, s and ă are beyond him ∴ Gāā āā m; tōmsn, t, ǒ, s again are lost, the central m is dropped before n; hence Gāā k n = Gāām Gāākn. The word house, h o w s, contains three difficult sounds ∴ ā ā ā. He lives at 142 Holden-street = wun undred un korky koo (failure of initial f sound) āāln keet (hō again lost, and str).

His effort at the Lord's Prayer, which has been taught him, is interesting as illustrating the gāā method of substitution and tendency to drop sounds in a series rapidly repeated.

Aa oo gāāeh oo aa in evan āā lawd bee Yah naam
 Our Father, who art in heaven, Hallowed be Thy name.
 Yāā kill dm gum Yah will be dun āān ehth ad
 Thy kingdom come. Thy will be done on earth, As
 ah kee in evan Geef eh dee dāā (lee) aa oo dāālee bed
 it is in heaven. Give us this day our daily bread.
 Un korgif oo āāōō keppēh āād vee korgif em ut keppēh
 And forgive us our trespasses, As we forgive them that trespass
 addaa uh āān leed uh nut ingoo kemgaan Bud deliver uh
 against us. And lead us not into temptation; But deliver us
 gum evil gaw nahndee yee kingdom yee boweh un yee
 from evil. For Thine is the kingdom; The power and the
 dawee gaw ever in ever. Amen.
 glory. For ever and ever. Amen.

The words correctly reproduced are in *italics*.

One more example of his quite ludicrous efforts may be given—a piece of poetry taught him by his mother.

Ven āa var āa kikken āa big oo āa en,
 Māa māa āaee it mee aa it mee agen;
 Māa gāagāa dāa māa un dāa me āa gāat;
 Aa gekkn māa gāa āa ed beeh ook āat.
 (sometimes better *look out*.)

The translation is appended :—

When I was a chicken as big as a hen,
 My mother she hit me and hit me again;
 My father came out and gave me a clout;
 I said to my father, “ You’d better look out.”

Such will serve to give some idea of the difficulty of understanding what seems outlandish language. Yet by reference to his powers, or want of power in pronouncing vowels and consonants, one can predict with considerable accuracy his version of any ordinary simple word.

Of the twelve children seen all were of good intelligence, one 14 years of age being in the highest class of the state school—a fairly severe test of brain effort. In two, attention was rather poor, and two boys, each about 5, seemed rather deaf. In the others auditory powers as tested by a watch were good. The two young boys mentioned had post-nasal growths, but the others were free from this. From the family history given it is obvious that the condition is a recoverable one, and it is certainly no indication of want of mental intelligence.

The interesting point, already alluded to, is that although they know when you are speaking properly, they seem quite unable to appreciate their own errors. Not from fault of ordinary hearing nor even the ear for sounds, but rather in the power of storing up auditory word memories. The fault is not in inability to articulate from a motor point of view, as in the slurring of a mental defective, for by obtaining their attention and focussing it on your own lip and tongue movements, quite good attempts at enunciation are obtained, to be promptly forgotten almost immediately.

Although at first sight a curious position, it is nevertheless an ordinary phase through which everybody passes in learning a language, particularly a foreign one. For example, an English person who has studied French so as to read and write it well visits Paris. After about a fortnight he probably will be able to follow quite well ordinary conversation around him, but when he speaks, or tries to speak French himself, the politeness of that nation alone controls the inevitable result of his laughable efforts. He finds that while he knows good French when he hears it, he only appreciates his own faults of enunciation with difficulty.

Even in ordinary life we meet stray examples of inability to produce certain sounds. I remember well an Australian clergyman of Ulster descent startling his congregation with a text : “ What is this lowin’ of the cattle and bleatin’ of the sheep in my ear? ” and a fine old notability of the church who, having read with great emotion one of the affecting lessons of Easter week, produced an anticlimax with—“ Now, Bawabbas was a wobber ” !

An enthusiastic rowing friend of mine with the same habit adjudicated in a boat-race, and ordered as his verdict on a close finish "A wee wō" (a re-row), to the complete mystification of all.

Numerous illustrations can be obtained in various languages and dialects, e.g., the *ü* of Scotch and German, the trilled *r* in Dublin, the Spanish pronunciation, e.g., of Don Juan = Hwan, or the Cid-thith, and contrast with this the failure of the French to say *th*. I remember noticing this when some English children tried to catch some French children with the old nursery game of asking the child to repeat "Grandmother, grandmother, thuth, thuth, thuth," and chucking up the chin on the protruding tongue. To the English disgust the French children said "Grandmerè, grandmerè, ter, ter, ter," and the chin trick absolutely failed.

The best example of all is the Maori language. Here the alphabet has only about twelve sounds, and everything must be fitted into these with, in the case of nouns, the addition of a terminal vowel; thus a Maori hearing the name Croft, says, "Yes, Mr. Korowhotu," or for "Babylon" says "Paparona." He thinks he is repeating exactly the sound he has heard.

Various historical examples can be cited; perhaps the best is the Old Testament story of the use of the word shibboleth, as a grim test between the tribes of Israel.

Can we, while giving a good prognosis for ultimate relief, hasten the progress of the case? I think so. Here the parents, especially the mother, can do much in insisting on the correct articulation of simple words. A teacher of oral language to deaf mutes would be useful. Nursery rhymes, as has been pointed out by Guthrie, which are so valuable in teaching correct phonics to young children, fail in the idioglossia case, for as soon as the child gets the sense of the verses he turns them into his own gibberish. Perhaps the best are nonsense verses like the Jabberwock, for the meaning is here absent, and the child, to do the lesson correctly, must simply enunciate correctly the sounds he hears.

It is interesting to note in connection with the development of our speech or language centres that this delay in development of correct articulation owing to want of satisfactory storage of word memories, and their linking up with motor speech, has been found in a few cases to be associated both with ambidexterity and left-handedness.

What I wish to emphasise most of all is that the defect in itself is no indication of feeble-mindedness. In several of my cases that mistake had been made. This is no more justifiable than it would be in the case of the closely allied loss of musical ear. Indeed, as in the case of many stammerers, rather the reverse—a mental capacity above the average—seems to be usual.

TREATMENT OF STAMMERING.

By GARNET LEARY, M.D. (Edin.), M.R.C.P.

Sandringham, Melbourne.

HAVING read a paper at Eighth Australasian Medical Congress in 1908 on the above subject, with practical demonstration by patients, a sympathetic chord seems to have been struck throughout Australasia, and even has attracted attention in other journals.

In response to scores of requests, this rough outline or epitome is the outcome of a few years' further treatment and experience, based on "fellow feeling makes us wondrous kind."

The success attained by one who was a martyr to this speech misfortune is in a measure due to personal régime and patience exercised in surmounting the difficulties with inspired confidence and indifference.

The etiology, as studied by Madam Behnke (London), is "want of co-ordination between the respiratory muscles and vocal muscles; the one or other lags behind." The harmony of the voice mechanism is thereby interrupted; the nerve centres which govern their movements fail to control them. Exercises designed to re-establish the exact and instantaneous co-ordination of muscles are given. Their continual practice reacts on the motor nerve centres in a similar way as gymnastics and massage do in certain cases of paralysis.

By analysis of many cases a predominating part seems to be played from constant association (sub-conscious reaction), mimicry, constitutional (after severe illness), scarlet fever, whooping cough, and heredity.

A neurotic temperament underlies most of these cases, and such a condition is accentuated by uncongenial surroundings, of which bustle and excitement usually form part.

Stammering is said to arise from nervousness, and even from lack of intelligence; but these factors are merely a bagatelle, and generally are the result, and not the cause.

Whenever conditions arise that elicit sympathy, or of fatigue, overdue anxiety and excitement, or in trying to conceal their misfortune before strangers, marked exaggeration of the speech hesitancy, accompanied by the physical movements, can be summed up as a lack of co-ordinating powers.

This results at times in an indirect nervous storm, as shown by a few cases under treatment where epileptoid conditions were closely simulated.

There is no hard-and-fast rule to follow, provided the patient is old enough to realise the position and to estimate the serious disadvantages that must be confronted in the battle of life, apart from a professional or commercial career. The whole *bien être* is enshrouded at times in misery amounting to morbidity, especially when the attainments have to be subservient to those of a much inferior order, and also tastes misdirected to some other channel.

The nature of the treatment, combined with good common-sense, should make the method not only a pleasure, but should be entered into with feelings of determination, waiving all sentiment of sensitiveness and reserve; until such is properly understood the *modus operandi* will not be successful, and the zest of earnestness lost.

As no two stammerers stutter or stammer alike, each case has to be taken on its merits and weighed subjectively and objectively; the determination of the cause, with other side issues, must be taken into account.

It is impossible to gauge or to prognosticate the amount of work and time to effect freedom and facility of speech unless the patient desires to "wipe from his memory all trivial, vain records."

1. General physical examination, with special relation to ear, nose, and throat troubles (especially sinuses).
2. Hygienic conditions, fresh air, sleep, baths, outdoor amusements, clothing according to temperature.
3. Dietary rules, avoiding too much proteid foods, and guarding against dyspepsia and constipation.
4. Segregation, first avoiding public school life, and old associations and surroundings.
5. Respiratory exercises, as described by Madam Behnke in "Speaking Voice"; also diaphragmatic exercises (in recumbent position) are directed towards the maintenance of respiratory control by the production of an even rhythm between inspiration and expiration, and increasing the chest capacity.

These are to correct proper method of management of breath, and thus to strengthen and exercise better command in various muscles concerned in speaking, more especially in mastering the economy of breath.

The movements ought to be slow, rhythmical, and performed with precision, in contradistinction to Sandow, and should entail from ten to twenty minutes three or four times a day.

Vocal gymnastics require much patience and grit. They can be compared (as Wyllie says) to the violin player. The evenness of bowing corresponding to evenness of respiration, and the difference of length of note corresponding to the difference of speech, in contradistinction to short, irregular, jerky breathing, which is naturally present in these cases.

The vowels are first articulated in prolonged natural tone, with the mouth widely open, so that sounds simulate a musical note, then in an explosive utterance.

A drilling in the rising and falling inflection of each vowel sound, by commencing the sound with an effusive utterance; rising to the full pitch of the voice, then by beginning with explosive force and gradually sinking to low tone again, the idea being to cultivate the economic expenditure of breath during articulation.

A firm volume of sound can be frequently maintained after a course of training on any of the vowels for about half a minute on inhalation.

Singers and elocutionists who are stammerers rarely stammer whilst singing or reciting, on account of exaggeration or emphasis of vowels at expense of consonants, thus making the words prolonged. Reading aloud syllable by syllable, with special emphasis on the vowels (touching the initial consonants with the tip of the

tongue at rate of 60-80 strokes per minute) and words, including all parts of speech, are all given equal value by prolonging the terminal part into the beginning of next word, thereby simulating at first a monotonous drawl or lalling.

No difficulty is ever met with if the pitch and monotone prevail until such time as the natural and unassumed tone can be easily commanded.

It is simpler to start with poetry or nursery rhymes which produce an agreeable rhythmical sound. This can be readily applied to conversation in the same slow, measured, and deliberate manner. The telephone can be used in a similar way, but presence of mind, calmness, and confidence are more easily inspired if a "dummy" or house telephone (speaking tube) were at first employed.

The average duration of treatment is about two or three weeks, when usually a fairly good grasp of the technique is shown, and a certain amount of control established.

Such rhythmical speaking must be maintained for some months, and the exercises on voice persevered with stringently.

It is not contended that such treatment will succeed in every instance. Personally, the failures noted have been not more than five in a consecutive series of thirty-three during the last three years.

Complete failure resulted in one case of a school girl (æ. 14), in whom emotional element was so pronounced as to render any attempt at rational exercises entirely futile; she was sent home after a week's patient endeavour.

Partial failure resulted in case of a man (27) who had been treated by various specialists elsewhere. Improvement appeared during a period of four months, in which treatment was fairly well adhered to, but relapse occurred owing to his disinclination to sustain the necessary restriction.

The other three cases (children 6, 8, and 11 respectively) lacked in a sufficient measure intelligence necessary to grasp the methods of treatment, and to treat the technique other than a task.

SURGICAL EMERGENCIES IN INFANCY AND CHILDHOOD.

By E. H. BINNEY, M.B.

Hon. Surgeon, R.A.H.C.; Hon. Asst. Surgeon, Sydney Hospital.

IN reading a paper under the above title, one is led to look back and review the occasions on which, as a surgeon, he has been called suddenly to give relief to some case that has been sent into a children's hospital. (It was suggested to me that it would be of interest to the general practitioners who might be attending the proceedings of this section, as such cases generally filter through the general practitioner's hands.) I claim nothing special that we can do in this direction, as the proceedings are mostly straightforward. The early recognition of symptoms, however, by the outside practitioner is a most potent factor in making for good results in emergency work amongst children. Operative procedures on the

young or newly born are sometimes imperative, and, I am sorry to say, are often delayed or postponed on the advice of the medical attendant, perhaps through yielding too much to parents' and friends' protestations that such things are unnatural, or from a firm conviction existing in the minds of many that children suffer severely from shock in early life. Our experience has taught us that results of operations may be very satisfactory in young and newly-born children, and that shock from anæsthetic or hæmorrhage is quickly overcome. Delays are sometimes dangerous, and render subsequent treatment more difficult in some cases, such as congenital talipes, hernia, double hare-lip, nævi, &c. The family doctor is often tempted to try medical or expectant treatment in cases that have surgical features from the first, yielding at times to the family's natural aversion to anything surgical. Such an attitude may be disastrous, especially in cases of acute bone and joint disease, acute appendicitis, and mastoid suppuration. In reviewing cases likely to require immediate surgical relief, I would conveniently group them as occurring at the following periods:—

- (1st) Congenital affections and affections of the newly born.
- (2nd) Cases occurring during the first dentition.
- (3rd) Cases occurring after this period and in older children.

Congenital Cases.—Such cases are generally brought under our notice by the accoucheur or accoucheuse, and include—(1) Imperforate anus; (2) hare-lip, with or without cleft palate; (3) various forms of hernia; (4) talipes; (5) spina befila; (6) nævi, &c.

In cases of imperforate anus, operation is indicated at once for the reasons of—(1) saving the patient's life, and (2) saving the child the pain and discomfort of death from unrelieved intestinal obstruction. A certain proportion of the cases can be relieved by puncture in the perineum; others require colotomy. It sometimes happens that the congenital defect consists in absence of a great part of the colon, and relief can only be obtained by right-sided colotomy. The result is, as you know, disastrous. Such cases have obvious signs and symptoms, and the need for relief is imperative. Hernia in young and newly born, if able to be controlled, might wait; but in many cases, especially inguinal hernia, the trouble is extreme, and the protrusion cannot be controlled, and tends to become strangulated. I have operated on many such cases, both strangulated and reducible, as early in some cases as a few hours old. The results have invariably been good, and the wounds healed well. The shock has been slight, and a minor operation—i.e., that of tying the sac high up—is all that has been required. The operation is very simple, especially in young new-born babies before any excessive fat has been deposited. A transverse incision, high up just over the internal ring, can easily expose the spermatic tissues, which are brought into prominence by good retraction of the testes. To the experienced the sac is easily recognisable, and easily separated from the other parts; it is tied at the neck, and nothing further is needed; a dry dressing may be applied, and lately we have not even covered them up. No damage is done to the abdominal ring or inguinal

valve, and after ligature of the sac effectively no protrusion shows itself. The child may go back to its mother after the operation, and the wound generally heals well. This, I think, is an imperative operation, and the indications are serious enough to make it justifiable, even if strangulation does not exist. The child is constantly in pain and crying, runs the risk of strangulation, and its nutrition and general health suffers.

Cases of umbilical hernia are not often urgent unless strangulated, and are more amenable to palliative treatment; moreover they tend to cure themselves as time goes on.

Hare-lip is not usually operated on in the early days of life. There are cases, however, where the repair of such a deformity is imperatively called for. The inability to suck often interferes with the bodily nutrition, especially in cases of double deformity. A total or partial repairing operation then is urgently called for, and such cases in our hands have done well. The babies take the anæsthetic and stand the shock well.

Lately I have not hesitated to operate at once in some cases of ghastly deformity from hare-lip, even before the mother has seen the infant. If the surgeon can contrive to prevent such a sight from ever being visible to the mother, I think a great deal is gained. Such a precedent may not meet with the approval of followers of Lane and Brophy in treatment of cleft palate and hare-lip.

The immediate excision of nævi and other vascular tumours is indicated, as they lead to growth rapidly in early life. Spino-bifida cases may come under the category of imperative operation, as it may be necessary in order to prevent septic infection; the results are good as far as immediate recovery is concerned, but bad remotely owing to the subsequent development of paralysis, talipes, and hydrocephalus.

Congenital talipes often demands immediate correction by tenotomy and appliance. This is often dictated by the circumstances of the patient, and is quicker than other methods which may give as good ultimate results. In such cases there is nothing gained by delay.

Amongst cases occurring in newly-born and very young children might be mentioned those acute and almost sudden subcutaneous abscesses that demand immediate incision. They appear often to be associated with some septic condition of the skin.

During the first dentition the acute surgical cases are mostly abdominal and thoracic; those including bones and joints are generally seen later, after the child has got on to its feet and been subjected to the jars and strains incidental to walking, running, or falling; previous to this it has been protected in its mother's or nurse's arms. I might note an exception to this in cases of acute epiphysitis in young babies; this is a condition that is important, chiefly in its early regulation; the treatment by immediate incision is then obvious.

At this period the most common sudden abdominal calamity is intussusception, the most common cause of intestinal obstruction in childhood, and at this period the most likely. I think already we

have been too guilty of inflicting this subject on the profession. My conclusions on this matter have been noted elsewhere. The diagnosis is simple, and can generally be made from the mother's or nurse's history. The cases are surgical as soon as diagnosed, and the results of laparotomy in early uncomplicated cases are good; in neglected cases, and such as occur in the course of a gastro or entero-colitis, the mortality is high, not so much from the operation as from the general condition.

Empyæma and other sequelæ or pneumonia are common during the first year of life. Rib-resection under anæsthetic has been the method adopted here; repeated aspiration or insertion of a trocar in an intercostal space has not received a trial. In bad-conditioned cases local anæsthetic has at times been used.

After the first dentition we come to the cases connected with bones and joints, and later in life to the other acute conditions, abdominal and otherwise, which are incidental to adults. Appendicitis is common in children, but most hospital surgeons must be struck by the fact of how often big boys and girls are attacked, and how seldom younger ones are affected. There may be something in the fact that as the child grows older he becomes out of hand as far as diet is concerned, and more likely to indulge to his full in indigestible material; he also has not such close scrutiny of his parents over motions, &c., and I suppose by now we recognise that the matter of diet and the condition of the bowels has an important bearing on the incidence of appendicitis; also we know that the foetal type of funnel-shaped appendix is not as likely to become constricted and cause a retentive appendicitis as the older organs. However it is, we know that the first attack recognised in a child is an acute one; perhaps that is why it is recognised. Parents do not go in for refinement of diagnosis in all complaints of belly-ache in their children; they give oil, which relieves most. Those which are not relieved appear to be cases for the doctor.

Cases of acute infective disease of bones and joints have always been looked upon as pitfalls of diagnosis in children's work, and we still meet many cases where diagnosis has been made too late. This will be so until it is recognised that rheumatism of a single joint is almost unknown in children; also that in true rheumatism synovial swelling and pain directly over a joint is a marked feature, whereas acute inflammatory trouble is found about the epiphyses, whilst synovitis and arthritis occur only as later complications.

The emergency operations that we are called on to perform in this later period of childhood for the above conditions are frequently life-saving measures; in the case of acute bone conditions the procedure consists in incision down to the bone, through the periosteum, followed by drilling or trephining the medullary cavity. Should it be likely that an acute arthritis, with suppuration, complicates the trouble, an exploratory aspiration might be done before deciding to open the joint—a wise precaution, as arthrectomy adds seriously to the severity of the case, and if the joint were only inflamed, as would be indicated by the nature of the fluid withdrawn, then the dealing with the original trouble may be sufficient. All original openings

on the bone and through into the medullary cavity should be left well open, to provide free drainage; any packing that is used should only remain sufficiently long to arrest hæmorrhage. Should such a case do well, you know it is through a process of very gradual separation of sequestra, helped at times by operation and formation of new bone. The subjects of such a disease are often invalids for years. That index is looked upon as a favourable result; the original infection may have extended locally to important structures so as to need amputation of a limb to avoid systemic infection, or systemic infection may occur leading to septicæmia, pyæmia, and death. We have all known such surgical tragedies to make us look on acute bone infections as one of the most deserving form of case for immediate surgical relief. In cases of acute appendicitis the rule is followed to operate on diagnosis, remove the appendix if it can be easily dealt with; the abscess only in difficult cases; and when in doubt, drain.

Amongst the rarer forms of abdominal catastrophies that have occurred with us where urgent operation has been undertaken might be mentioned : gangrene of the small intestines; thrombosis of mesenteric vessels, resulting in gangrene; septic peritonitis from rupture of tubercular and syphilitic ulcers, or from traumatic causes; pneumo-coccal peritonitis; twisted pedicle of ovarian cyst, &c.

Abdominal section in most of the above is a forlorn hope only, but some unexpected recoveries have led us to give the patients a chance. Some cases of pneumo-coccal peritonitis, where the involvement seemed general, have recovered after timely section and drainage; and other cases, where bowel involvement was considerable, needing resection and intestinal anastomosis, have shown their recoveries where operation gave the only chance. Apart from intussusception cases, to which reference has already been made, bowel resection, when low down in the canal, gives the patient a chance; whether to do it in stages—i.e., by formation of an artificial anus, and subsequent anastomosis, or immediately, is not yet definitely decided. The procedure depends on the features of each case and the general condition, and I should suggest the position in the canal where the trouble occurs.

In this paper I have not as yet referred to surgical emergencies occurring in childhood directly as the result of accident. They present no special features except where they involve organs that have any special developmental features—e.g., a depressed fracture in a baby, where, for instance, the parietal bone is depressed like the hollow seen in a rubber ball. Foreign bodies in food and air passages are essentially children's disorders more than adults. The subject of laryngeal and tracheal obstructions, and the question of trachæotomy, is familiar to you all, and has been commented on in connection with the question of diphtheria. I have not dwelt on the question of hydatid of the lung, that sometimes gives alarming symptoms resembling acute laryngeal obstruction, as it is not specially a children's disease. Acute mastoid abscess is common in children, not so much in babies, and generally comes under the care of the specialist.

TREATMENT OF ASTHMA.

By F. S. W. ZLOTKOWSKI, M.B., C.M.

Hon. Assistant Physician to Royal Alexandra Hospital for Sick Children.

I HAVE chosen the subject of the treatment of asthma, not because I have anything particularly new or original to offer you, but because I wish to place before you a general method of treatment which I have found to be successful.

It is perhaps needless to say that in dealing with asthmatic subjects each case must be treated strictly on its merits. The family history, patient's general physique, and the nature of his attack are all important factors in the treatment and prognosis. Heredity plays a large part, both in determining the grade of severity of the attacks which the patient is liable to have, and also the chances of a permanently good result following the treatment.

In all my cases I have been able to find a definite history in either or both parents. In cases where the history shows that either parent, having had the disease early in life, has secured immunity later, the prognosis is much more favourable.

Before proceeding to speak of the treatment of asthma, it would be well to mention briefly the different varieties of the disease usually met with in children. According to the classification of Holt, there are four distinct variations—(1) and (2) occurring in very young children, and simulating attacks of acute bronchitis; (3) hay fever; and (4) ordinary asthma as seen in the adult. I would wish to add to this classification a form of asthma which has frequently come under my observation, and which seems to me to deserve a position by itself as a distinct and definite form of the disease. It occurs, as do most cases of true asthma in the child, about the eighth year. The patient is apparently healthy and sound, sometimes with, quite as frequently without, any uric acid history. More frequently is there a history of asthma itself in either mother or father.

The first symptoms are those of an ordinary cold in the head, sniffing at first, followed by constant sneezing, then a discharge of mucus from the nose, and the child presents all the ordinary signs of a common cold. This continues for about three days in most cases, and never less than two in any case. The temperature then gradually rises, until on the second or third night it may reach 102 or 103 degrees. The breathing then begins to take on the characteristic asthmatic form. In bad cases there is deep epigastric and suprasternal recession; the face is livid, and there is almost always a degree of delirium. This condition continues for about thirty-six hours, when the symptoms begin to abate. As a rule, the patient has two very bad nights and one very bad day. On the second day and third night he begins to improve, and will be breathing normally in about five days from the commencement of the dyspnoea, although any undue exertion will at once bring about a

shortness of breathing. He is liable to relapse within the first eight days, when the foregoing symptoms are repeated, and with less severity, and are overcome with much greater ease.

The attack leaves behind for about two weeks a cough and some degree of dyspnoea on violent exertion. These attacks occur about every six weeks.

This description applies to an ordinary untreated attack. It is the treatment of this variety of asthma in children which I propose to describe.

The treatment may be divided into—

- (1) Treatment of the attack itself.
- (2) Treatment of the periods between attacks. The latter I have placed under separate headings thus:—
 - (a) Dietetic.
 - (b) Drug.
 - (c) Climatic.

(1) Treatment of the attack itself.

When called into a case of asthma our efforts must first, of course, be directed to alleviating the spasm. Should this be very severe, it may be necessary to give a few inhalations of chloroform; but this is not often necessary. The administration of morphine and its derivatives has not been very satisfactory in my hands with children. On the whole also I have been disappointed with the use of the inhalations of nitrate smoke. In some cases it did a little temporary good, in others none at all, and in some seemed to cause greater distress.

Rotch has stated that there is no one drug which has any definite effect on the spasm. In my experience this is not the case, as for some time past I have been using a drug which has a most definite and salutary effect on the spasms—that is, antipyrin. My custom is to give it in full doses, 5 grains to a child of 7 every four hours, every three hours to a child of 10.

I find that it causes some headache as a rule, and a degree of muscular weakness of the legs greater than when it is not used; but this passes off very quickly, and instead of the attack lasting for at least four days I find that this time is reduced to less than half, and the convalescence is much more rapid than usual.

The only other expedient which has proved occasionally useful with me is painting the naso-pharyngeal mucous membrane with adrenalin—I in 1,000 to 1 in 4,000, according to the severity of the attack. When the attack has subsided it is well to examine the throat and naso-pharynx for enlarged tonsils and adenoid growth, when these will frequently be found to be present. They are to be removed, but a guarded prognosis must be given, because, though they are no doubt aggravating the trouble, they are in no sense the cause of it; and, generally speaking, I have found that though the patient is much freer from attacks for some months afterwards, that he relapses again, and is as bad as ever if no other treatment be resorted to.

(2) Treatment during the periods between attacks.

It is to this particular part of the treatment that most of our energies should be directed.

(a) *Dietetic*.—In almost all cases it will be found that the dietary of the patient has never been supervised. He is allowed to have anything he may fancy, and his fancy nearly always turns to meat and sweets in large quantities. Very frequently also it is found that the patient suffers from more or less severe constipation, which has never been systematically treated. It is my practice to at once set the child on a rigid diet, consisting of cereals and vegetables (chiefly green), milk, and fruit. Ordinary meat is allowed only three or four times a week, and never at the evening meal. Sugar is given very sparingly. It is so often found that the child is allowed to pile sugar on his food, refusing to eat it otherwise. In this latter contingency saccharin may be substituted. All pastry, cakes, and confectionery are to be absolutely forbidden, and the meals taken at regular intervals. Nothing is to be given between meals with the exception of a glass of milk, with bread and butter, at 11 a.m., and the same between lunch and tea-time. The patient must be in bed by 7 p.m., and all theatres and evening parties, &c., strictly tabooed.

In my experience improvement invariably begins from the time when the child's dietary is carefully and constantly watched. It is my practice to treat the constipation by regular doses of calomel; for a child of 8 years $\frac{1}{2}$ grain is given three times weekly before retiring to bed, whether the condition of the bowels requires it or not. I have nearly always found that the worst attacks occur when the patient has been more than usually constipated for some days previously.

(b) *Drug Treatment*.—The drug treatment of the intermediate period I look upon as most important and very satisfactory. I give a mixture containing iodide of potash, grains 4, and sod. sal., grains 4 (for a child of 7 years), three times a day. As soon as this, with the change of diet, is commenced it will be nearly always seen that the intervals between the attacks grow longer, and the attacks themselves less severe.

Sometimes it may happen that a premonitory wheezing may be observed on some evening when the ordinary attack is about due. In such an event the free exhibition of antipyrin has—in my hands at least—met with most gratifying success. I have frequently been able to definitely ward off what previous experience showed would have been a four days' attack by a single dose. For a child of 7 I give 5 grains at bed-time, and, should there be any sign of wheezing in the morning, a further dose of 5 grains after a cup of milk.

I have never once observed any ill-effects from the use of this drug, and would urge its much more general use.

(c) *Climatic*.—Patients differ widely in the effect which climate has upon their attacks. Some do better near the coast, and others

inland; but wherever experience shows that the patient does best it should be insisted upon that he spend as much time as possible out of doors, and that he should sleep in the open air.

I have seen benefit derived also from a systematic and regular course of deep breathing exercises in the intermediate periods. There are many forms which these must take, but they must be carefully supervised and carried out regularly every day.

I have chosen as an illustrative case the worst of this particular variety which I have seen.

For some years the child, a male, had had periodic attacks at intervals of about every six to eight weeks. They were very severe, the dyspnœa was very marked; there was much epigastric and suprasternal recession, face livid, and utter prostration, temperature 102 to 104 degrees. These attacks lasted in the severest stage for thirty-six hours, but did not subside for at least four to five days. The inhalation of nitrate smoke did no good. In this case the diet was at once carefully planned, meat cut out, and sugar much diminished. Calomel was given regularly, and this was continued whether the condition of the bowels demanded it or not. Enlarged tonsils and adenoid growths in the naso-pharynx had been already removed. Sod. sal. and iodide of potash were commenced, and improvement at once began.

As soon as the first sign of wheezing appeared during the next attack, antipyrin, grains 5, was given at bed-time and three times the following day. By the next evening—i.e., twenty-four hours after the inception of the attack—the dyspnœa had lessened sufficiently to allow him to breathe in comparative comfort, and the antipyrin was continued during the second day. The only ill-effects noticed were headache and much muscular weakness, which quickly passed off. Systematic breathing exercises were ordered and carried on daily.

The child had had these attacks constantly for three years, but after six months' treatment has now a very occasional attack of a very mild nature. The spasm in this case, after the first use of antipyrin, instead of lasting actually over four days, was reduced to a little more than twenty-four hours, and the attack itself was much milder.

I may say that of late I have been able to definitely abort attacks by early and free use of antipyrin in the first catarrhal stage. The points which I particularly wish to emphasise are two:—

1. The paramount importance of the treatment of the intermediate period.
2. Successful results to be obtained by the free use of antipyrin, both to alleviate the attack itself, and, more important still, to act as a prophylactic.

X.

SECTION OF NAVAL AND MILITARY—
MEDICINE AND SURGERY.

PRESIDENT'S ADDRESS.

By COLONEL JAMES PURDY, M.D., C.M., D.P.H.

Hon. Physician to H.E. the Governor of New Zealand; Director of Medical Services, N.Z.

ALTHOUGH fully conscious of and deeply appreciating the high honor done to me in asking me to preside over this section, I cannot help expressing my sincere regret that Colonel Chas. Ryan, who was originally nominated as President, unfortunately was unable to accept office.

The advent of compulsory training in Australasia has considerably altered our outlook, and increased our responsibilities; the future of the citizen army depends upon us in a large measure, for we are virtually responsible for the proper physical training of the cadet, and we select the men who are to be trained in the citizen army. It stands to reason that although a boy may be physically able to undergo training without detriment to his constitution, in fact, with considerable improvement (for I am persuaded that compulsory training will prove of the greatest service to the State in the improved physique of its youth), yet there is a considerable difference between a cadet and a youth of 18. The cadet is being trained with an object; in the territorial of 18 that object is accomplished. As a cadet he was being trained with a view to his entering the army; as a youth of 18 he is now to be trained with a view to help in the defence of his country; in other words, he is now to be trained for war; consequently, only the very best of the youth of the country should be taken. There is no sense in training up a soldier to fight, and when the day of battle comes finding he is unable, for physical reasons, to do so. A youth of 18 must have absolutely no weakness of constitution in order to make an efficient soldier, for he has not only to march many miles in a day, but he has to carry a fairly heavy equipment, at least 30 lb. weight. The regular soldier carries a 60 lb. kit, and after a march of many miles he may have to fight.

The exigencies of modern warfare demand a very high physical standard of fitness. During the Russo-Japanese war it is reported that the Japanese soldiers sometimes in their final rush covered 600 yards. I do not think this can be accurate, for I believe it to be a physical impossibility. The Devons, in their historical final rush, are said to have covered 100 yards; the usual distance covered in the final rush is about 50 yards, and this after some fifteen consecutive rushes of from 25 to 40 yards, with the sudden flop at the end of each rush, which alone is a great strain upon the man. At Tourinikau Camp, in New Zealand, I had several opportunities of seeing men being trained in the attack, and I am quite satisfied that only men of the very highest physical stamp can possibly stand the modern methods of warfare. In the British army manœuvres of 1910 some battalions marched as many as 33 miles in a day, and then fought a battle. Therefore, although a youth may be comparatively healthy and able to do a good day's work at his trade or business, he may not be quite fit enough to make an efficient soldier. Germany and Switzerland are proofs of this. We often hear Germany quoted, and it is generally believed that their conscription net enmeshes all their young men, whereas, according to the last conscription returns, Germany only took 26 per cent. with the colours. The figures for Germany are, however, misleading; it has so many men available that they only need to take 26 per cent. to make up the numbers they require, and so they make many exemptions for wage-earners, &c. However, it has generally been found that the average rejects for a well-selected army in healthy communities work out at about 40 per cent.

I venture to assert that at present fully 40 per cent. of the youths of Australasia, for some cause or other, are unfitted for efficient military service, and I also venture to assert that in the course of a very few years, owing to the great improvement in the national physique that will be effected by compulsory training, that the percentage of unfit men will be very greatly reduced. At present we can only guess at what that reduction will be; but as I presume accurate records are being kept of the results of the medical examinations, in course of time we will be able to see in how great a degree the physical training of youths from 14 to 18 has benefited the nation at large.

The exigencies of modern warfare not only demand thoroughly fit soldiers, but also highly accomplished officers in all branches of the service. In our own branch, up to now, except by a few of the military public, the proper function of a medical officer has been held to be the healing of the sick and the treatment of the wounded; actually, however, that is not his most pressing duty. In all wars it has been proved that civilian practitioners can always be had in large numbers, so that as far as treatment goes there is not much necessity to organise a medical corps; but it is in administrative duties that hitherto in all wars the want of properly-trained medical officers has been severely felt. This is now fully recognised in England. Since the Boer war the Royal Army Medical Corps has been thoroughly organised, and is now considered to be a highly efficient force; the medical officer is now trained in strategy and

tactics, and just as a combatant officer has now to know something about hygiene in the field so the medical officer has to know something about the ordinary combatant officer's work. Everyone recognises in the army the great use of an army service corps; they all appreciate the tremendous difficulties that have to be contended with to get supplies up to the front. It is somewhat strange, therefore, that until very recently it was never realised generally that it is as difficult a problem to get a wounded man down to the base as to bring a dead bullock up to the front. All this entails a great deal of work upon the medical officer. Armies are organised to fight, and the more men we can keep in the fighting line so much the better chance have we of winning the battle. This is not done by the performance of brilliant surgical operations, nor by the successful treatment of serious disease, as the men who require such treatment are—at any rate for a considerable time—of no use to the army. In war-time the value of our department depends upon the prevention of disease, the rapid evacuation of sick and wounded, and the immediate treatment of minor ailments and injuries, so as to get the men back to the fighting line in the shortest possible time. It is now universally recognised in war-time that the slightly wounded men are the first that should be looked after, so as to prevent them falling into the hands of the enemy.

Now, all this requires careful organisation. It is generally agreed by military experts that in the wars of the future there will be a series of decisive battles and numerous sick and wounded; the strain in the medical department will therefore be enormous, and unless we train our officers in peace-time efficiently in the work they will have to do in war the department is bound to break down, with the result that, owing to there being such a large percentage of sick and wounded in the field, the whole of the military movements are endangered, and the battle in all probability lost. I must not, however, occupy your time here in Sydney dwelling on this point. Your colony was, I believe, the first country in the world to have a properly-organised, properly-equipped medical force; you proved in South Africa what could be done by well-trained medical officers and troops, and I am glad to say, from what I have seen and heard since my arrival here, that you are keeping up your traditions, and are still the efficient force that was the admiration of all who saw it working in South Africa.

Under the compulsory training scheme we will here, as well as in New Zealand, I presume, be brought up to full war strength; and if ever we have to take the field we will be able to do so thoroughly equipped with our own trained officers and men, and not have to call upon any outside help. The training of the officers and men must therefore of necessity be an arduous task. We have no special training school, and I am afraid the expense would be too great to hope that one will be established. Consequently, the officers will have to get their training in ambulance corps, and I am strongly of opinion that all officers, before being attached to regiments, batteries, &c., should have served in a field ambulance. As far as I can judge, it is the only available way in which we can train officers.

An ambulance corps for officers should be attached to each medical school, and then we would have periodically a stream of officers well trained coming into our corps when they leave the schools to go out into actual practice. I am also a firm believer in staff rides, both medical staff rides and the ordinary military staff rides. Commanding officers of troops should in every way encourage medical officers to study war problems, and should give them like opportunities with other officers for so doing. We are now recognised officers of the army; we are no longer called surgeon-captain or surgeon-major, and so on; we dress the same as other officers, and I think in the new citizen army all the military officers will now recognise what only a few of the greater minds amongst them have done in the past: that a medical officer is an important factor in war, and that the greater knowledge he has of military problems so much the more will he be of service to the army.

THE DEVELOPMENT OF THE AUSTRALIAN ARMY MEDICAL SERVICES UNDER UNIVERSAL MILITARY TRAINING.

By SURGEON-GENERAL W. D. C. WILLIAMS, C.B.

Director-General Medical Services, Commonwealth Military Forces.

OWING to the limited time which naturally has to be allowed to each paper, an outline only is submitted of a subject which must be of the greatest interest to us all, and of the greatest national importance to the Commonwealth, and that is the future development of the Australian Army Medical Services under universal military training.

Within the next two to three years it will be necessary to provide an organisation for the medical services which must be adequate and efficient to cope with the system of universal military training as now laid down, and able to take its place, on a war-footing, with an army in the field.

Now, what are the main points we have to consider to attain such an end? They may be brought forward as follows:—

1. The grouping of medical service training areas into one training centre as a brigade unit. Keeping in view that wherever any area can supply the majority or bulk of the personnel of the unit required—and that is a field ambulance—that such area should, for reasons of economy and efficiency, be considered the training centre.

2. Provision of required personnel, viz.:—

- (a) For an army in the field—adequate for regimental medical services and field ambulances.
- (b) For lines of communication, embracing clearing hospitals, stationary hospitals, rest camps, sanitary service and sections, advanced depôts of medical supplies, ambulance trains, general hospitals at base, base depôts medical stores.
- (c) The army nursing service for hospitals on lines of communication other than clearing hospitals, and also for general hospitals at the base.

- (d) The army medical corps reserve, comprising: Medical officers for duty with field units, lines of communication, and general hospital; pharmacists; dental surgeons; other ranks for duty as bearers, nursing duty, transport and special trades, and replace casualties.

When the detail of the personnel as above described is worked out the figures will be found to be rather startling, and I earnestly desire that this section will thoroughly realise the demand which will be made on the medical service.

With 224 training areas, each having to provide its own quota towards the medical units, to be so organised as to fit in with each of the twenty-three brigade areas (for a field ambulance is the brigade unit) will entail an immense amount of detail in order that an efficient service may be secured. This is quite apart from the Light Horse Field Ambulances, whose number has not yet been determined. There must be a great increase of medical officers for commands and appointments to the units—officers who are prepared to undergo that training which is absolutely essential—non-commissioned officers and men who are conversant with their duties, and capable of performing them in the most efficient manner, without which they would be useless with an army in the field in time of war. Now, gentlemen, where is this personnel, both for officers and other ranks, to come from; and how is the requisite training to be organised and carried out? At present this personnel does not exist, even in imagination. In metropolitan areas and larger country towns it should be possible to obtain a sufficient number of medical officers required for units, but not so in small and scattered areas.

Cannot we look to our Universities to assist us with personnel for non-commissioned officers and men from the medical students who are within the ages prescribed for military service? If this could be arranged, not only would the very finest material be available, but the students would take up a branch of the service in touch and sympathy with their University career, and would be able to comply with the requirements of the Act with as little dislocation of their medical studies as possible. They would go through the ranks of the A.A.M.C., become N.C.O.'s, and eventually commissioned officers, knowing their service in a most thorough and efficient manner. In the last three to six months of their service N.C.O.'s could be given a month or six weeks' special course for the training of officers—in fact, the establishment of recognised training schools for this purpose should be adopted in each of the University States for the training of officers and N.C.O.'s of higher ranks. Without training schools a high standard of efficiency cannot be reached.

Now we are on the subject of personnel, let us consider what has to be taken into consideration, and the provision to be made for medical services.

We have some 224 training areas grouped into twenty-three brigade areas, with over 114,000 men in training.

To organise a medical service, complete in itself, self-controlled, under one system of training, decentralised, in the proportions that will be laid down for each State, is our one and only object.

The regimental medical services would require 177 medical officers, and for which a reserve list of 20-25 per cent. would be necessary to replace casualties, &c.; stretcher-bearers as supernumerary to the battalion establishment, specially enlisted and specially trained under the medical officer, is the only solution of the difficulty. For years this has been advocated in our service, and within the past twelve months Germany, Austria, and France have adopted this system.

The twenty-three field ambulances absorb 230 officers and 4,922 other ranks; over 353 vehicles, ambulance waggons, and transport; and 2,326 horses.

So far we have only dealt with the bare requirements of the troops at the front, and we have now to face the problem of the medical services on lines of communication and the base.

The personnel for clearing hospitals, stationary hospitals, sanitary sections, ambulance trains, rest camps, dépôts (advanced and base), and general hospitals at base, must be provided for trained and allotted to their respective units, before the complex machinery of the medical service can be started, or, even if it be started, it would soon stop, unless during peace-time it had been efficiently established in numbers, equipment, transport, and training under the highest possible grades of efficiency. Under the lowest computation, for this personnel for lines of communication and base it would amount to over 1,500 officers and men.

In this, our reserve system, as applied to medical officers and pharmacists, should play a most important rôle, and I hope the day is not far distant when we shall be able to welcome the dental surgeons as comrades in our service. The army nursing service in each State, who have made themselves proficient in every duty in the field as applied to their special branch, would have to be greatly increased, and I would suggest that a reserve list of nursing sisters be kept in each State of ladies who would join the nursing service in time of national emergency.

I also trust that the present establishment of the army nursing service may in the near future be considerably increased. There is not any unit in the A.A.M.C. service which is more efficient than the army nursing service, and they deserve the highest praise and every encouragement.

Briefly, thus we must deal with the personnel; but let us remember that we have only provided for bare numbers required to take the field under fixed establishments, and no provision has been made to fill up those casualties which must ensue under service conditions. Establishments of units are laid down on hard-and-fast lines, so that the unit starts its career fit for its work and efficient in its various needs and requirements; but not any provision is made for wastage, and as soon as this occurs, and it must occur, the unit, unless replenished with personnel, equipment, and transport, must suffer in efficiency, and this efficiency defect is in proportion to unsupplied wastage.

The importance of a thoroughly organised and thoroughly equipped sanitary service is a national one, and it will be my earnest endeavour that each State shall be so provided for at the earliest possible date. It should take precedence of all other items.

3. *Training of Medical Services.*—That this must be thorough for all ranks is a point beyond argument; but the question arises, how is it to be obtained? We must realise, in order to have this training, which would turn out the high standard requisite, that well-equipped training depôts are necessary, a staff of highly-trained and up-to-date instruction officers and N.C.O.'s, and definite instruction schools, periodically carried out, extending over a term which would suffice to impart the knowledge required. A medical service is not made in a month, nor a year, and God help the troops who may be dependent on an improvised or inefficient one.

This question of training is one which should be gone into by the D.G.M.S. in conjunction with the State P.M.O.'s, as a committee.

Training schools could easily be formed in each State in conjunction with, and part of, the depôts of medical and surgical equipment, by which means the service would be able to study, handle, and familiarise themselves with the items of equipment which would be in every-day use in the field.

Higher Training of Officers.—This is one of the most vital points we have to dwell upon, and one that has to be faced and carried out.

The greatest importance is now paid to this in the Imperial service, and every facility afforded to enable officers to grasp and deal with the higher standards which modern tactics for medical services now demand.

Topography, staff tours, and especially medical staff tours, would form branches of study in this sphere of higher training.

Without a knowledge of these, which place an officer in a position to thoroughly deal with the higher problems which come before him on service, the ideal has not been realised.

4. *Equipment, Vehicles, Horses, Harness, &c.*—Every regimental unit should have its own field equipment at the headquarters of the battalion, under the charge of the medical officers attached; and the same applies to each field ambulance.

It would be a good plan to devise a type of depôt for a field ambulance capable of containing its equipment, vehicles, harness, &c., and which should be adhered to throughout the several States.

With their quota of horses for ambulance transport, then the field ambulances would be ready to take the field at a few hours' notice.

Such, gentlemen, are briefly my views of an ideal medical service for the Commonwealth Military Forces, and it is the ambition of my life to see the accomplishment.

It is only a question of organisation and money, and when the importance is realised I feel confident our Australian army medical services will receive that support and encouragement which would soon place it in the front rank, second to none, and a service on which the army could rely and the Commonwealth be proud of.

SANITATION AND HYGIENE IN THE FIELD.

By J. S. PURDY, M.D., F.R.G.S., Surgeon-Major, N.Z.M.

THE records of the South African war show that four men were lost from disease usually classed as preventable to one who died from wounds. In the Spanish-American war fourteen Americans died from sickness to one from wounds. In the Russo-Japanese war the proportion, as far as the Japanese were concerned, was reversed, only one dying from disease to four from wounds.

The difference was undoubtedly due to a great extent to the fact that every Japanese soldier, from the G.O.C. to the file in the ranks, by regular instruction and frequent repetition of the principles of hygiene, combined with rigid discipline, almost automatically carried out not only the sanitary regulations for service in the field, but was imbued with the importance and had acquired habits of practising personal hygiene.

Most people who have had experience of troops, both regular and irregular, in the field will agree that unless every man has had training in the practice of safeguarding his own health and that of his comrades the most elaborate sanitary arrangements and means for preventing the spread, more especially of intestinal diseases, will break down.

In the South African campaign, 1899-1902, the ratios per 1,000 of strength were: Admissions to hospital for disease, 746; casualties in action, 34. Deaths from disease, 69; from wounds or killed in action, 42.

Thus, while all the chances against death in the Boer war were nine to one, the odds against death in action or from wounds were nearly twenty-four to one.

In 1903, and again in 1909, I tried to obtain the sickness and death rates of the overseas and South African colonial contingents as distinct from the regular troops, but was informed that the separate lists had not been compiled. As far as the later stages of the war were concerned, the man who thought to save his life or to have an easier time by dodging his column on one pretext or another ran a greater risk of losing it amid the dangers of contracting disease in a remount dépôt, a rest camp, or other standing camp, than in the field, where the constant trekking gave little opportunity for a column to become fouled by its own excrement.

As compared with the incidence in times of peace, war conditions hitherto have generally meant a six-fold increase of intestinal diseases, diarrhoea, dysentery, and enteric fever. In South Africa it has been estimated that no less than one-tenth of admissions to hospital were for enteric fever, and one-fourteenth for dysentery. These two diseases are credited with one-sixth of the total admissions to hospital on account of disease, and about two-thirds of the total deaths on account of disease. Nearly one-half of the total mortality from all causes during the war was due to these two intestinal diseases. I firmly believe that flies caused the infection in South Africa, and so one might assert that flies were more deadly than

Boer bullets. To quote an experience with Plumer's column, the Fifth Queensland Imperial Bushmen, during a fight in the Wakkerstrom district, at Vaal Bank Spruit, in which they fired 14,000 rounds of ammunition, had fourteen casualties. About two months later I took a convoy of 110 sick into Charlestown Hospital, the majority of whom were down with enteric fever.

Until after Onverwacht, when the column had fifty-six casualties, and had to return and refit at where we went into a standing camp for a fortnight, we had few cases of enteric. It was very exceptional for Plumer's column to camp more than one night in one place, and it was therefore very noticeable that, shortly after going into a standing camp at Wakkerstrom, we had the epidemic of enteric fever.

In the light of more recent knowledge, more especially of typhoid carriers in the shape of men apparently quite free of any after-effects of typhoid, still voiding the organisms either in fæces or urine, and the accumulated evidence of the great factor flies are in the carrying of disease, it is easy to understand how an epidemic breaks out in camp and spreads with an ever-increasing rapidity proportionate to the length of time the troops remain in that camp, unless adequate precautions are taken, not only by those responsible and in authority, but also by the men.

To reduce the incidence of sickness and mortality in any future war there are, therefore, two main requisites: the education of the soldier in hygiene and discipline, together with better sanitary organisation.

In the British Army, profiting from the experiences of South Africa, and learning from the Japanese, all ranks now receive instruction in the why and wherefore of disease-prevalence among soldiers in the field, and the best means of preventing epidemics such as enteric fever. At the same time, selected men from all corps, not only the R.A.M.C., are specially trained in the principles and practice of field sanitation.

Special encouragement is given to members of the Royal Army Medical Corps to specialise in sanitary science, and sanitary medical officers are attached to the chief depôts and field forces.

As one of the three New Zealand medical officers who had the privilege of undergoing a course in military hygiene at the R.A.M. College, I can testify to the excellence and thoroughness of the training, and recommend any man attached to the Army Medical Service of Australia or New Zealand, should opportunity offer, to avail himself thereof.

The control of latrines, refuse disposal, and general sanitary duties in corps or units in the field is carried out by sanitary squads drawn from each unit, whilst the Royal Army Medical Corps supplies squads to the posts on the lines of communication.

With regard to water purification, perhaps the most essential of all sanitary requirements, the R.A.M.C. has men specially trained as water squads employed in camps, securing, if necessary, purified water for the troops.

In each county attached to the Territorial organisation in England are local medical officers of health as special sanitary officers, each of whom has to develop the nucleus at least of a sanitary corps.

With regard to camp sanitation in New Zealand, the Health Department reports to the O.C. District on the water supply in respect to each camp.

If the source has not been properly tested, or there is any suspicion as to contamination, samples are taken, which are examined bacteriologically by the Government Bacteriologist.

In some cases a chemical analysis has also been made. On two occasions in the Auckland district water has been condemned which had probably been the cause of sickness in previous camps at the same place.

On another occasion, after visiting a suggested site in company with the O.C., it was found advisable to change the location of the camp originally chosen owing to proximity to drainage from a slaughter-house.

Care is taken, where water is obtained from a river or stream, that the horses are watered below the point from which water is drawn for the supply of the men.

In some camps water has been actually laid on to the camps by installing a water-main in the shape of a 2-inch pipe. Where it was not found possible to get bathing facilities, as at the New Town Park, Wellington, S.A. contingent camp, douches were installed, which proved a great boon to the men. This system of installing shower-baths is preferable to what used to obtain at the North Camp, Aldershot, when the Volunteer Medical Staff Corps used to go into training there in the nineties, and it was quite common to see one medical student putting the hose on to a comrade near the Army Service Corps stores.

The next great problem in field sanitation is that of conservancy.

In the actual field, however perfect the sanitary organisation, even if the German, French, or United States, or Griffith's steriliser be available for the main body of troops, it must always happen that from time to time, owing to the exigencies of warfare, detached parties of troops will not be able to get water which has been sterilised for them. I am firmly of opinion that for Australian and New Zealand troops the best and most rational system is to encourage every man to boil water for himself.

During the South African war we found that the Australian troops preferred tea to lime-juice. I remember suggesting to Lieutenant-Colonel Porter, S.M.O. to Plumer's column, that instead of having lime-juice served out to our men it would be better to give them a double ration of tea, as such would ensure their boiling the water.

Although at that time such could not be done owing to regulations, I am pleased to see that the Home authorities now universally recognise that this will be an effective means of getting water sterilised. Certainly, with our troops, with whom the use of a billy

is universal, the filling of the water-bottles with boiled tea before a march would be quite in keeping with their accustomed habit of tea-drinking.

When discussing in the *Lancet* this question of tea-drinking by the Australasians in the South African campaign, thus securing the boiling of the water as a preventive of enteric fever, I pointed out that although the Chinese live for the most part on a germ-saturated soil, they are singularly free from enteric fever and other diseases of which water is the medium of communication. This condition has been attributed to the universal custom of copious tea-drinking. It is only fair to mention, however, that in Egypt, where the natives are great water-drinkers, there is a similar relative immunity as compared to Europeans. Whilst in charge of the hospital at the great Hedjaz Pilgrimage Quarantine Camp at El Tor, in the Sinai Peninsula, in 1906, when we had 110 deaths from dysentery in a period of six weeks, one was also struck with the remarkable absence of enteric. Evidently immunity to enteric is sometimes acquired by other means than either anti-typhoid inoculation or a previous attack.

In 1908 the shallow trench straddle latrines were introduced into most of the New Zealand camps.

Each trench should be 3 feet long, 18 inches deep, 1 foot broad at the top, and, as suggested by Major Caldwell-Smith, of the Second London Sanitary Company, 1 foot 3 inches at the bottom. The upper edge of the trench should be rebated, leaving a ledge 6 inches broad and 4 inches deep on each side of the trench, thus giving a purchase to the feet when the soldier is in the squatting or natural position for defecation.

There should be an interspace between each trench of at least $2\frac{1}{2}$ feet. There should be five 3-foot trenches for every 100 men. There should be a heap of earth in the rear of the trench, together with a scoop. This form of latrine is the simplest and cleanest, entails least preparation, can be quickly filled up, and ensures least nuisance. A fresh latrine should be dug each day. Every latrine should be screened off either by canvas or a hedge of tea-tree or other material. Two small cross-screens can be placed at right angles for privacy. Care should be taken to place the latrines away from any standing bush or scrub, otherwise one finds certain men prefer to go into the bush. The success of this simple sanitary natural latrine, which should always also be adopted for officers as well as men, depends upon the excreta being quickly and completely covered with earth. This is not only to prevent the nuisance from smell, but also the danger of flies gaining access, and so food becoming contaminated with the filthy feet of fæcal-feeding flies. To make assurance doubly sure, it is as well to spray the area with kerosene or a mixture of kerosene or petrol with some disinfectant such as izal, cyllin, or kerol.

Another point to which Colonel Melville in his recent lectures has drawn attention is that in digging new sets of trenches you

must always come nearer to camp, not go further away. Men will not in that case have to tread on dirty ground on their way back to their tents.

It is a good plan, if for no other reason than to show the importance of this part of camp sanitation, that the sanitary officer or the medical officer should himself superintend the digging of the latrines and explain to the men told off for the duty not only the principles of structure, but the reason for so much attention being paid to this subject.

Experience shows that even in the best regulated camps the average individual is careless, and often neglects to cover the excreta. The remedy is to make the care and conduct of latrines a matter of discipline.

The orderly officer of the day should personally inspect the latrines at least twice a day. This important matter should not be delegated to the quartermaster, who is not an executive officer.

We found in the Easter camp at Auckland in New Zealand, that the awarding of a prize for the best-kept lines and the giving of marks for the state of the latrines, each regiment having its own, was some incentive to keep these places in order.

It would, perhaps, do some good to issue a short leaflet to every man going into camp on somewhat similar lines to that circulated in the Japanese Army, with instructions as to practising a few sanitary principles. The issue of and circulation of an extract of the excellent little handbook on "Camps and Camp Hygiene," by Major Mullins and Armstrong, would probably be a means of disseminating knowledge broadcast on this and other important details of sanitation.

As to the disposal of urine, the consensus of opinion now seems to favour soakage-pits, with a system of radiating gutters as described by Lieutenant Martin in the *R.A.M.C. Journal* for June, and in Colonel Melville's lectures in the *Journal of the Royal Sanitary Institute* for April. Even where night urine tubs are used, it is necessary to dig a pit into which they may be emptied. The pit is about 4 feet square, with two trenches each 12 feet long and 2 feet wide, with a gradient of 1 inch for each foot of run. The pit is filled to about one-third of its depth with stones, old tins, and burnt rubbish from the camp destructor.

Disposal of Refuse.—This is the third great sanitary problem in camps. In New Zealand, so generous is the ration of food allowed that there is a considerable amount of refuse. These remnants of food attract flies, the greatest danger next to a contaminated water supply one has to fear in camp. It is a good practice to encourage the men to eat their food in the open, and to discourage the storage of food in the tents. Whatever food is retained should be kept in closed tins or boxes, so that flies may not gain access to it.

Care must be taken that kitchens are located at least 200 yards from latrines. In my experience with camps in New Zealand I

found that the problem of keeping the kitchens clean was the worst to tackle. As a rule, the cooks were civilians hired merely for the camp, and one had to be very tactful in getting them to carry out even reasonable precautions to keep the place clean. As Surgeon-Major Hardie Neil, in an article on "Flies in Relation to the Sanitation of Camps," in the *Haversack*, March, 1908, remarked, "Bush cooks are not known to have any definite ideas on hygiene."

The usual custom is to throw all slops and scraps into a hole near the kitchen. This would not give much trouble if care were taken to dig a fresh hole each day after having the old one filled in. Cremation is the ideal system for disposing of refuse, both in town and in camp. As far as possible, the company's kitchen fire may be utilised. It is generally necessary, however, to build a field destructor, which can be made by digging two trenches, intersecting each other at right angles, each trench 9 inches deep and 5 feet long. At the intersection a shaft is built of sods, with a support of hoop-iron. A fire is lighted at the base of the chimney, and, once started, may be with the addition of a little kerosene, it should be fed steadily by throwing rubbish and refuse down the chimney. This does not, however, solve the problem of the kitchen sullage, which is generally disposed of more or less satisfactorily by a soakage pit, with an intercepting improvised grease trap of straw, brushwood, or other material. Lieutenant Martin strongly recommends three straight trenches, each 6 feet long, 1 foot wide, and 2 feet deep, as giving the largest percolating area at the smallest cost of labour.

Tents.—Where two waterproof sheets are available, and a couple of blankets, men are much better sleeping in the open, and not in a tent with half a dozen or more comrades. It is not always possible to camp long at certain seasons and places without having to take shelter from the rain.

With regard to bell-tents, I am pleased to see that these are now the subject of adverse criticism. The tents are not adapted for ventilation at any time, and when the flies are let down and the doors laced up I think everyone will agree with Colonels Giles and Caldwell that they are not ventilated at all. The fact that they only weigh 45 lb. each, and are readily pitched, is probably why they are still in use. The tent which found most favour in South Africa was the European Private (Indian pattern) tent, commonly known as the E.P. Unfortunately, its weight of 600 lb. is against its general use. Colonel Caldwell strongly advocates the use of the Indian service tent. The "Hubert" tent used by the Tenth Canadian Field Hospital, which is a modification of the "Munsen" tent of the United States Army, seems to be the nearest approach to an ideal tent. To quote from the report of the Board of Medical Officers on the medical arrangements of the South African war:—"The Board have formed a very high opinion of this tent, and consider it very suitable for both mobile work in the field and for stationary work. It is far superior to any pattern tent which they have seen in South Africa, and would strongly advise its introduction in our field equipment."

Blankets and bedding should be sunned and aired each day by spreading them on the sunny side of the tent-roof, or, better still, by hanging them on supports consisting of two forked sticks with a cross-bar.

Clothing should, of course, be as much as possible composed of wool, a bad conductor of heat and a good absorber of moisture.

The Army regulation shirt is made from a mixture of cotton and wool, which is lighter and cheaper than pure wool. It is more durable, and does not shrink unduly in washing.

If it could be arranged, I think it would be an excellent idea if members of defence forces could buy underclothing, socks, and Army pattern boots either from Defence Stores or by arrangement with some contractor.

Boots.—Great care must, of course, be taken of the feet during field manœuvres or a campaign. Woollen socks should be worn and changed each day, the feet being washed at least once every day. Statistics show that 25 per cent. of troops on field service sustain more or less injury to the feet as a result of the first few days of marching. The real remedy is to have a well-fitting boot, a soft smooth sock, and constant cleanliness.

The regulation ammunition boot for the British Army has a wide sole and a low, broad heel. It is made in thirty-two sizes. There must be eight stitches per inch for the upper leather, and the thread must be strong and well waxed. Recently boots with heels which screw on, and are reversible, have been suggested, and no doubt in the future we will see some improvement in foot-gear for the soldier. Having done duty for three months with the escort to Plumer's Ox Convoy, and witnessed the marching of the Royal Munster Fusiliers, the Somerset Light Infantry, and the Gordon Highlanders, all seasoned troops, I know that this question of the care of the feet is one which should be taught to every infantryman, and that route-marching should be made a special feature in training.

Vermin.—Of recent years considerable attention has been given to the rôle of insects as carriers of disease. Although the subject is an unsavoury one, unfortunately the prevalence, more especially of pediculi, in a campaign was not peculiar to the South African war. The best way to get rid of these pests when it is not possible to boil all the clothing, is by the use of paraffin, which is practically a panacea for all insects when it can be practically applied.

Believing that the greatest advancement in the future in the way of decreasing the amount of sickness in a campaign will come from the teaching of, and application by, the individual soldier of the principles of hygiene and the prevention of disease, I commend as an example the following syllabus of a course of instruction in military sanitation for non-commissioned officers and men, supplied to me by Major Blackham, R.A.M.C., Divisional Sanitary Officer, First (Peshawar) Division, India.

THEORETICAL INSTRUCTION.

FIRST LECTURE.

Introduction.

The importance of sanitation in war. The causes of disease. The means of infection. The more important communicable diseases of soldiers. Cholera and Dysentery. Flies and Enteric Fever. The life history of the common house-fly.

SECOND LECTURE.

Malaria and Mosquitoes.

Military history of Malaria. Insects and disease. The life history of the mosquito. The habits of mosquitoes. The malarial parasites. The campaign against malaria. Our resources and our allies. Mosquito-nets and how to use them.

THIRD LECTURE.

Air and Ventilation.

Simple physiological principles for the need of fresh air. Constituents of air. Sources of impurity of air. The composition of dust. The sweeper in relation to the air of bungalows. Consumption and ventilation. Spitting and the spread of disease. The tooth-brush in relation to personal ventilation. Animals and the pollution of air. The necessity for ventilating bedding.

FOURTH LECTURE.

Water and Water Supplies.

Pure water the prime necessity of military life. Its proportion in the body and most articles of consumption. Quantity of water required. Appearance and palatability as a guide to suitability for drinking purposes. Diseases caused by water. Sources of water. The storage of water. The pollution of water. The purification of water. The water-bottle. Water discipline.

FIFTH LECTURE.

Food and Alcohol.

Varieties of food required. The quantity of food necessary. The methods of cooking and their effects on food. The different systems of messing. Food on active service. The value of sugar as a food. Tinned foods and their examination. Alcohol in peace. The danger of "tots" of rum on cold nights. Spirits in war.

SIXTH LECTURE.

Clothing.

Reasons for the use of wool. The necessity for well-fitting garments. Clothing materials. The importance of boots and socks as essentials to marching efficiency. Means of water-proofing. The cholera belt. The dangers of belts and putties worn around the waist. The dangers involved by "chills" in the tropics. The reasons for the frequent change of garments and the desirability of night shirts or pyjamas. Orange-red clothing and heat exhaustion.

SEVENTH LECTURE.

The Care of Barracks.

Overcrowding and its dangers. Barrack Rooms. Cook-houses. Water storage. Ablution Rooms. Latrines. Urinals. Disposal of kitchen and table refuse.

EIGHTH LECTURE.

Disposal of Excreta and Refuse in Barracks.

Various methods. Points to receive special attention. Flies and their dangers. Soil pollution of the vicinity of barracks a menace to health, especially in India.

NINTH LECTURE.

The making of the Soldier.

Objects of physical training. The British Recruit and Continental Conscript. Action of tobacco. New system of physical training. Courage and Sanitation. Mental and moral education. Exhaustion and Enteric Fever. Over-training.

TENTH LECTURE.

The Camp and the March.

Sites. Tents. Sleeping shelters. Cooking places. Latrines. Urinals. Disposal of refuse. Effects of Marching. Halts. Footsoreness. Sunstroke.

ELEVENTH LECTURE.

Disinfection and Disinfectants.

The objects of disinfection. Meaning of terms. Various methods in use. Short account of chemical disinfectants used in the Army. Practical application of disinfection. Disinfection of wells.

TWELFTH LECTURE.

Venereal Diseases.

The effects of venereal disease on military efficiency. The risk, apart from venereal disease, associated with visits to the Bazaar.

THIRTEENTH LECTURE.

Sanitary Organisation in Peace and War.

Water duties in peace and war. Sanitary Squads. Sanitary Sections. The Indian Sanitary Company. The sanitary lessons of important campaigns. The *results* which have been obtained in our military service in peace and war due to improved sanitation.

FOURTEENTH LECTURE.

Personal Hygiene.

Much neglected in Crimean days. "The Stench of the Barrack." The necessity for washing the hands before meals. The dangers of handling food supplies with unwashed hands. Baths and bathing. The care of the feet. The care of the hair. The care of the teeth. Insect parasites.

PRACTICAL TRAINING.

1. *Barrack Rooms and Dining Hall.*

Visit and demonstration on :—

1. Cubic space and ventilation.
2. Water storage, especially in hot weather.
3. Food storage.
4. Washing-up after meals.
5. Sweeping.
6. Night urinals.
7. Pets and their dangers.
8. The use and abuse of mosquito nets.
9. Soil pollution of the vicinity of barracks.

2. *Cookhouses and Ablution Rooms.*

Visit and instruction on :—

1. Cooks and their clothing.
2. Personal cleanliness of cooks.
3. Washing-up.
4. Disposal of refuse.
5. Disposal of greasy water.
6. Prevention of fly infection.
7. Dangers of pools of water in dark places.
8. Disposal of waste water.

3. *Latrines and Urinals.*

Visit and instruction on :—

1. Sites.
2. Construction.
3. The "wet" and "dry" systems of sewage disposal.
4. Treatment of latrine pans.
5. Supervision of sweepers.
6. Dangers of dirty seats.
7. Night urinals, their use and abuse.

4. *Disposal of Excreta.*

1. Visit to Incinerators.
2. Visit to trenching ground.
3. Demonstration on the care of Crowly Carts.

5. *The Practical Construction of Camp Latrines, Urinals, and Crematories.*6. *Water Supply.*

1. Visit to station supply and wells.
2. Demonstration of methods of filtration by mule filters.
3. Instruction in the use of Griffiths' Water Sterilizer.
4. Instruction in the use of Chemical Water Purifiers.

7. *Mineral Water Manufacture.*

1. Visit to a Factory.
2. Explanation of methods of manufacture.
3. Dangers of contamination.
4. The making and storage of syrups.
5. The storage and cleansing of empty bottles.

8. *Dairies.*

Visit to Government Dairy and practical demonstration on :—

1. Storage of milk.
2. Storage of butter.
3. Pasteurization.
4. Cleansing of utensils.
5. Supervision of milkers.

9. *Slaughter Houses.*

Visit and demonstration on :—

1. Inspection of animals.
2. Inspection of beef and mutton.
3. Disposal of offal.

10. *Cantonment Bazaar.*

1. Visit and note methods of sewage and refuse disposal.
2. Inspection of native mineral water factory.
3. Inspection of all places where food and drink are sold.

11. *Bakeries.*

(Government Bakery at Chuppri), first day :—

1. Visit and inspect method of making bread.
2. Demonstration of dangers from careless storage of materials, dirty hands, &c.
3. The making of yeast.

12. *Bakeries.*

(Regimental Bakeries), 2nd day :—

1. The methods of native Bakers.
2. Mussalah compared with yeast.
3. The four stages of Bread-making.

13. *Disinfection and Mosquito Destruction.*

1. Practical demonstration at the Station Hospital of methods of disinfection in actual use at the station.
2. Practical instruction in methods of mosquito destruction.

14. *Food Inspection.*

Demonstration on the inspection of ordinary articles of food : Tea, sugar, vegetables, condiments, milk, &c.

OUTLINES FOR A DISCUSSION OF A NAVAL MEDICAL SERVICE FOR THE COMMONWEALTH OF AUSTRALIA.

ADMIRAL HENDERSON'S report makes the following suggestions:—

Medical Officers.—To be entered as surgeons for three years, with the option, if their services are required, of extending their service for further periods up to a maximum total of nine years. On completion of three years' service or more, to be eligible for Naval Reserve, if required. Those who join the Reserve to be paid a retaining fee up to the age of 40.

To have the rank of surgeon on entry—*i.e.*, to rank with lieutenant—to be eligible for advancement to rank of staff-surgeon on completing eight years' service on active list, or on active and reserve lists, and on passing the necessary examination. I suggest that the Australian Medical Association be consulted as to the general conditions of pay, entry, qualifications, &c., of medical officers, and as regards the provision of hospital accommodation for naval patients, the provision of additional medical officers in time of war, and the training of sick-berth staff, &c.

I am of opinion that it is not necessary to establish a large naval medical staff for service in time of peace, if arrangements can be made, by a system of retaining fees to civilian medical practitioners, to civilian nurses, and to hospital attendants, for adequate personnel and accommodation, to be available in time of war.

Rates of pay in the Royal Navy are as follows:—

Surgeon—On entry, £255 10s. per annum; after four years, £310 per annum.

Staff-Surgeon—On promotion, £365 per annum; after four years, £438 per annum.

The proposed rates under Admiral Henderson's scheme would be approximately as follows:—

	£	s.	£	s.	£	s.
Surgeon on entry ...	273	15	+ 18	5*	292	0
„ after 4 years ...	319	7	+ 18	5*	337	12
Staff-Surgeon on promotion	387	16	+ 18	5*	406	1
„ after 4 years	433	8	+ 18	5*	451	13

In addition to the above, the senior medical officer in flagship or naval barracks is entitled to an allowance of from £45 to £91. The value of the ration is taken as being 1s. 2d. a day extra.

* Allowance to cover cost of uniform.

The number of officers required in the course of the next two years is approximately twelve, and as one senior medical officer will be required for the flagship, it is suggested that an officer from the Royal Navy should be lent for a period of two years. He should be an officer who has paid special attention to the question of naval hygiene, and he should organise classes in order that these principles should be thoroughly assimilated by the younger officers.

The qualifications laid down for surgeons to be temporarily employed in time of war or emergency* in the Royal Navy are as follows:—

To be registered under the Medical Act as qualified to practise medicine and surgery in Great Britain and Ireland.

To produce certificate of good character.

To be reported physically fit after medical examination.

Age not to exceed 40 years.

Pay, £401 10s.; or 22s. per day. Lodging allowance, if quarters not provided when employed on shore, £50; and £24 per annum in lieu of rations. Allowance on first joining to cover cost of uniforms, £20.

Conditions of Service.

To engage for six months certain, but liability to serve will be limited to five years.

To serve when and where required from date of signing.

To be able to immediate discharge for misconduct or incompetency.

To rank with, but after, surgeons in permanent service.

To be under the general rules of service as regards discipline.

To receive two calendar months' notice of service being no longer required.

To be granted two calendar months' pay on discharge if not discharged for misconduct or incompetence.

Voluntary retirement allowed subject to convenience of service, but such retirement forfeits bounty.

The qualifications for entry as surgeon are not given in the King's Regulations, but are obtainable on application to the Secretary of the Admiralty. It is understood that the conditions are under revision at the present time.

Surgeons are promoted to staff-surgeons after eight years' service.

The conditions of training and service of sick-berth ratings are as follows:—

Candidates undergo a course of six months' training in a naval hospital, and during this period they are on probation. At the end of their training, if found fit in every respect, they are confirmed in the rating, and are placed on a roster for draft to H.M. ships in turn.

* Emergency means mobilisation for war, and may be taken as the same thing. No entries have ever been made under this scheme.—B.M.C.

A sick-berth attendant, on completing three years' service in that rating, if of good character, is eligible for examination for the rating of second sick-berth steward.

The subjects for examination are:—Nursing the sick; reading and writing; accounts; bandaging and dressing; medicines and medical stores; compounding drugs; cooking for the sick; and serving out provisions.

A second sick-berth steward, on completing three years in this rating, if of good character, is eligible for examination for sick-berth steward.

Sick-berth stewards are advanced to the rating of chief sick-board steward, and to the warrant rating of head wardmaster by seniority, tempered by selection.

Examination for sick-board steward is the same as for second sick-board steward, but a higher standard is expected, especially as regards bandaging, dressing, and dispensing.

It has been placed on record that the probationer's course is too short, and it will probably be increased to twelve months in the near future. It is also considered that examination should precede promotion to chief sick-board steward and head wardmaster.

The rates of pay recently proposed in the Royal Navy are as follows:—

	Pay.		Ration.	
	s.	d.	d.	
Probationary sick-board attendant ...	1	4	+	9½ and pension.
Sick-board attendant	1	8		
„ after three years ...	2	0		
2nd sick-board steward	2	3		
„ after three years ...	2	6		
Sick-berth steward	2	10		
„ after three years ...	3	2		
„ after six years ...	3	6		
„ after nine years ...	3	10		
Chief sick-board steward	4	2		
„ after two years ...	4	6		

Chief sick-board stewards receive 6d. per diem when in charge of stores, and an allowance of 1s. per day for massage if so employed, which it is proposed to commute to 6d. per day to men qualified for this duty. Wardmasters appear to be paid on the same scale as other warrant officers, viz., £100 to £164 per annum. Maximum pension, £120 per annum. Rates of pay for nursing sisters range from £40 to £160 per annum.

The rates of pay authorised for the Commonwealth Naval Forces are as follows:—

	Pay.	Deferred Pay.	Rations, &c.	Total.
	s. d.	s. d.	s. d.	s. d.
Acting sick-berth attendant	3 0	0 9	1 11	5 8
Sick-berth attendant	4 0	1 0	1 11	6 11
Second sick-berth steward	4 3	1 1	1 11	7 3
" " over 3 years	4 10	1 1	1 11	7 10
Sick-berth steward	5 2	1 3	1 11	8 4
" " over 3 years	5 6	1 4	1 11	8 9
" " over 6 years	5 10	1 5	1 11	9 2
Chief sick-board steward	6 6	1 6	1 11	9 11
" " over 3 years	6 10	1 7	1 11	10 4
" " over 6 years	7 2	1 8	1 11	10 9
" " over 9 years	7 6	1 9	1 11	11 2
" " over 12 years	7 10	1 10	1 11	11 7

The rating of warrant officers does not appear to have been allowed for, but assuming that the pay will be the same as for other ranks, it amounts to from £205 to £304 per annum, or from 13s. 2d. per diem upwards.

The ration, &c., estimate is made up as follows:—6d. per day towards cost of uniform; 1s. 2d. in cash or ration; 3d. estimated value of medical attendance.

THE SCOPE OF WATER ANALYSIS IN MILITARY SERVICE.

By E. S. STOKES, M.B., C.M., D.P.H., Captain, A.A.M.C.

WHEN I commenced to compile the few remarks forming the subject of this communication, I was inclined to think I should preface the paper with an apology for submitting it to a meeting of medical men; but as the making and interpretation of water analysis does not fall to the lot of men in general practice, I felt that perhaps what I propose to say might go towards removing some of the erroneous ideas which I have found to exist, even amongst medical men, as to the real value and significance of analysis of water under conditions met with in military service, and that I had therefore some justification for this production.

I am aware that on account of never having been engaged on active service my arguments may, perhaps, lack the force they would be entitled to were they to emanate from an officer who has had such experience; but as it is our bounden duty in times of peace to study and consider situations that arise in actual warfare, I have endeavoured to reduce my disability to a minimum by becoming conversant, as far as possible under the circumstances, with matters relating to my subject as revealed by various official reports and publications. Furthermore, the interpretation of analyses is a duty which my every-day work enforces on me so far as civil life is concerned, and in this paper I am endeavouring to apply my experience *mutatis mutandis* to the conditions of military service.

First, let us briefly glance at the principal points to be secured in water analysis. Three general schemes of analysis are in vogue at the present day, viz., chemical, bacteriological, and biological. Chemical analysis, as ordinarily carried out, includes the estimation on a purely empirical basis of certain physical attributes of the water, namely, colour, turbidity, and smell. Colour is recorded as corresponding to that given by known solutions of certain salts, generally of platinum; turbidity as the depth of column necessary for the obscuration of a standard light, or a standard piece of bright platinum wire, compared with a standard silica suspension; and odour, which cannot otherwise be shown, merely as a personal impression. In the chemical examination proper, chlorine, existing as chlorides, ammonia, either free or in inorganic salts, nitrites, nitrates, sulphates, and phosphates are estimated. Also, search is made for poisonous metals, lead, zinc, copper, and arsenic. The alkalinity or temporary (*i.e.*, bicarbonate) hardness, and also the permanent hardness (*i.e.*, from sulphates, chlorides, nitrates, &c.) are determined. As regards organic matters, two estimations are made, one of the nitrogen in organic combination, the amount of which is returned as albuminoid ammonia, and the other of the organic carbon, which is given in terms of oxygen absorbed from acid permanganate of potassium under certain fixed conditions. Other constituents that it may be necessary to estimate for special reasons are the total solid residue on evaporation, both amount and constituents, the suspended matter, and the dissolved gases, especially oxygen and carbon dioxide.

Bacteriological analysis includes the estimation both of the number and forms of bacteria in the water; and biological examination means the estimation both qualitative and quantitative of the smaller forms—generally microscopic—of animal and vegetable life invariably found in water.

In order to carry out these analyses, three essentials are involved—(1) A laboratory; (2) the necessary apparatus; and (3) time sufficient to faithfully perform the tests. With regard to the latter, an ordinary chemical analysis could be made in a day. For a bacteriological test the minimum time is four days, and then the results would only be presumptive, whilst a biological examination might occupy any time from a few hours to a week or so, depending upon the extent of the search.

Various standards have been laid down with reference to the amounts of several chemical and bacterial constituents in water; but while useful in some circumstances, they abound in pitfalls for the unwary, and are regarded by authorities at the present day as not dependable for general application. Strict adherence to such standards—mostly laid down by chemists in the early days of water analysis—would lead to the condemnation of many well-known safe water supplies.

Now, having accomplished the work of analysis—which, of course, does not of necessity devolve on a medical man, but may be conducted by a skilled laboratory worker—the sanitarian comes upon the scene to pronounce his verdict on the water. From a consideration of an analysis only no one is able to express more than a very hesitating opinion, and consequently a very useless one, when a prompt and decided answer is called for, as to the potable quality of a water supply except, perhaps, in the rarer cases where the figures are extreme, or the water contains some recognised poison. It is absolutely necessary for the correct appreciation of a water that the reporter should have a complete, and preferably personal, knowledge of the local surroundings of a supply. Neglect in this respect has led to such absurd fallacies that I am constrained to present the point with all the emphasis at my command. You may feel disposed to ask if, under these circumstances, analysis is ever of any value at all, if it is not only waste of time. To this I can best reply by saying that analysis, in my opinion, occupies an important secondary and complementary position to complete local knowledge. By itself its value is small. Considered in conjunction with field observations, it becomes all-important.

With these preliminary remarks I now pass on to the consideration of my subject proper, namely, the functions of water analysis in military service.

Perhaps the best way to put the matter before you would be to consider a concrete example. You find yourself on service in such a position that you are called on to say whether a supply of water which will be reached by thirsty troops half an hour or half a day later is fit for consumption or not. Assuming that you have had opportunity for examining or have received reliable reports regarding local surroundings, are you forthwith going to set to work,

with such scant apparatus as you can take with you, to make an incomplete chemical analysis which will lead you nowhere, or are you going to still further delay your decision by undertaking a more prolonged bacteriological examination? There can only be one answer. And yet I understand we are supplied with toy cases of tabloids for testing water, and are, I presume, expected to regard these tests as serious, or, at all events, if we do not deceive ourselves, to lead our commanding officers to believe that we are doing something real and substantial. This is mere quackery, and in every way unworthy of men in our profession.

Obviously, therefore, water analysis has no part to play under circumstances just outlined, and one may naturally ask: are there any times on service when it has any useful application at all? I can only imagine such to exist in standing camps or occupied towns, when time is allowed and apparatus available for a complete examination to be made. It may then be of service as evidence corroborative to data secured by careful review of the surroundings of supply, or possibly in enabling a decision to be arrived at when there are two or more equally available sources, and a choice can be made without embarrassing military operations.

It may appear that I have dismissed the question in a very few words; but I do not see what would be gained by labouring the point. I might, however, be permitted to illustrate my contention by referring to what was done in the way of water analysis in the last great modern campaign between the Japanese and Russians. My information is derived from the official reports published by the British War Office, and deals only with the Japanese practices.

The duty of carrying out analyses is placed upon the apothecaries of the army (1). The apparatus provided (2) is the "Water Analysis Case," 13 in. x 8 in. x 8 in., which contains—

1. Reagents.—Nessler's solution, nitric acid, oxalic acid, nitrate of silver, sulphuric acid, barium chloride, chromic acid, permanganate of potash, distilled water, empty bottles.
2. Apparatus.—Evaporating dishes, test tubes, graduated pipettes, litmus paper, crucible holders, test-tube brush.

Field hospitals, reserve medical personnel, and line of communication medical units are supplied with this case. The medical service, with combatant and other non-medical units, do not possess one.

The tests that could be made with these reagents and apparatus are very limited in number and of doubtful significance.

Very little is mentioned in the reports about any actual analysis, but here and there a remark is found. Lieutenant-Colonel McPherson (3) states:—"The battalion medical officers have no chemical or other analysis cases in their equipment, but they generally have with them reagents for testing qualitatively the presence of chlorine, organic ammonia, and oxidisable matter. With these they determine roughly whether well-water should be labelled 'unfit for drinking' or not. It should be mentioned that all these village wells are sunk in the village streets or in patches of cultivated ground, and it is difficult to imagine any of them giving good qualitative analysis results. I have seen very few, however, labelled 'unfit.'"

With regard to the selection of supplies, the same reporter states (4):—"The selection is made from a rough physical examination. The medical officer rode round the village with an adjutant and an orderly; when they came to a well water was drawn and brought to the medical officer, who, without dismounting, looked at it to see if it was clear, and tasted it once or twice. No other examination was made (5). Although the first selection is purely physical, the battalion officers, after they have settled down into quarters, analyse the water qualitatively as far as lies in their power, but they have no special equipment for this purpose. Any analysis of the kind rests entirely with them. . . . If they think it necessary to have a more detailed analysis of the water they apply to have this done by one of the medical officers of the divisional field hospital. . . . The field hospitals are equipped with a fairly satisfactory case for chemical analysis. . . . But the chief point I have noted in this connection is that the determination of good or bad water is not carried out according to any recognised modern scientific method, at any rate for some days, or even after weeks, after a village has been occupied, or never at all when an army is advancing against the enemy."

Lieutenant-General Burnett, C.B., reporting from the point of view of a combatant officer, tells practically the same tale (6).

While this paper was in the course of preparation I received the April number of the *Journal of the Royal Sanitary Institute*, which is mainly devoted to a series of lectures on army sanitation by Lieutenant-Colonel C. H. Melville, Professor of Hygiene, Royal Army Medical College. Incidentally, I can strongly recommend these lectures for your consideration, but in particular I wish to quote an extract from the one dealing with water supplies (7):—"There are three ways of ascertaining the qualities of a water. One may examine it chemically or bacteriologically with test tubes of microscopes, or one may examine it by the light of common-sense. It is impossible to compare these three methods from the point of view of relative value; each has its own proper rôle to play; but I will go so far as to say that the one indispensable method is that of common-sense. This is at the disposal of all who possess that rare article."

After giving details of two cases where the potable qualities of supplies were decided, after survey of the surroundings, contrary to directions indicated by chemical and bacteriological analyses, the writer goes on to say:—"I quote these two instances because they illustrate very aptly, in my opinion, the absolute necessity of inspecting personally every source of water which it is intended to utilise before definitely pronouncing for or against its use. In any case it must be always kept in mind that the utmost one is justified in saying after making a bacteriological or chemical examination of water supply, is that in such-and-such a quantity of water, usually about 10 oz. in the first, and 2 to 4 pints in the second case, one was or was not able to find certain dangerous bacteria or their companions, or certain chemical substances which usually point to organic, and therefore possibly specific, pollution. On these slender

grounds we have to form our opinion as to whether a water supply running to hundreds of thousands of gallons is sufficiently pure to be safe or sufficiently impure to be dangerous. Chemical and bacteriological tests are of enormous importance as elucidating the result of personal inspection, or when it is desired to keep watch on a supply that has already been found to be pure, to guard against casual contamination. To rely on them, and then alone, is one of the most dangerous mistakes a sanitary officer can make. I venture to press the matter somewhat strongly, because we used to read in the daily press during the late war in Manchuria of Japanese medical officers riding with the advanced guard with microscope (and I believe I am right in saying test tubes) to examine the water before the troops arrived at the camp ground. I should be very loth to believe that the sanitary officers of the Japanese army are not sufficiently instructed to be able to recognise, without any such recondite methods of research, the possibilities and probabilities of any particular water supply being dangerous or not. Remember that in service we are not dealing with certainties. In the case of a large municipal installation it is necessary to know, accurately, exactly what there is or is not in the water, since on that knowledge depends the decision as to whether large and expensive purifying installation must be put up. On service this is not so. The possibility of contamination is sufficient to demand purification; and the safest rule, the only safe rule in fact, is to look upon all open sources of water as being dangerously contaminated."

I must admit that I read the above with a good deal of satisfaction, because it entirely confirms the views I hold in the matter, and because it presents a most apt summary of the situation as regards water-analysis in military service.

It is not germane to my purpose to deal with other aspects of the subject of water supply, but as I have removed, or attempted to remove, any faith you may perhaps entertain as to the virtues of water-analysis, it might be only fair to balance my destructive efforts with some compensating action. The watchword in dealing with military water supplies, as in all military concerns, is "Be prepared." In this case it is be prepared to treat and sterilise every drop of water the troops drink. It may not always be necessary to do this; it may not always be possible; but, notwithstanding, we must at all times be prepared, and whenever possible—whether necessary or not—must treat and sterilise the water.

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1. Russo-Japanese War, Medical and Sanitary Reports, p. 19.
2. " " " " " " p. 378.
3. " " " " " " p. 427.
4. " " " " " " p. 433.
5. " " " " " " p. 436.
6. " " " " " " p. 448.
7. Journal Royal Sanitary Institute, April, 1911, p. 198.

A NEW FIELD DRESSING.

By MAJOR B. J. NEWMARCH, F.R.C.S.I.; M.R.C.S., Eng.,
L.R.C.P. (Lon.), V.D.

THE field dressing now issued to troops in time of war is obviously only of service as a protective application. I do not think anyone would dare to rely on its asepticity.

I believe I am right in stating that the last pattern does not contain the macintosh cloth. Very early during my service in South Africa I discovered that wounds covered by dressings where the macintosh cloth was used were invariably septic, and where this was omitted the results were decidedly better.

During the Egyptian campaign certain civil surgeons used iodoform, and the improved condition of wounds was so marked that suggestions were given to introduce iodoform in the first field dressing. Objections were raised on the score of expense, but chiefly on the difficulty of application of a solid drug and the storage of a volatile drug in the dressing.

I believe everyone will agree with me that if an antiseptic could be added to the dressing it would increase its value enormously. The first dressing is too often responsible for the subsequent condition of sepsis or asepsis; a dirty dressing is worse than none at all, and I fear the application of the present dressing has caused much sepsis by the contact of septic hands and fingers in its necessary use. I have for a very long time thought that if some preparation could be introduced into the dressing which would be efficient and easy of application we would, even at the cost of a little addition to the primary cost of the dressing, more than save such cost by the saving of life and limbs, the shorter stay in hospital, and quicker return to duty.

The introduction of spirituous solutions of iodine in the preparation of skin before operation, especially in urgent cases in civil hospitals, its extended and valuable use in accident cases, the very simplicity of its application, and its success in practice, suggested it as the best preparation to be added to the dressing. It is not possible to use iodine in solid form, and for many reasons solids are not of practical use, since one has to make a solution.

I obtained interviews with an enthusiastic member of the firm of Burroughs and Wellcome, and we went into the matter carefully. It was suggested to put the iodine solution in a pewter case, but eventually it was decided to try the glass ampoule or vial which you now see. This is contained in a wooden cylinder. The quantity will be 4 drachms in the completed dressing, and is quite sufficient for ordinary use. The solution is the ordinary B.P. tincture, which is a $2\frac{1}{2}$ per cent. solution. In ordinary use we find a 2 per cent. solution in spirit quite sufficient, and it will be quite allowable to dilute the tincture if required. The macintosh will, of course, be omitted. The directions will be slightly amplified. A better and more efficient method of sealing the packet has been adopted, and the dressing is really prepared aseptically.

The only objection that I hope will be made is the cost. The cost of my dressing is 1s. 2¼d. as against 6d. now charged for the old dressing; but I venture to say that the materials are better, and for the reasons I have already given the War Office will get good return for the outlay.

My thanks are due to Messrs. Burroughs and Wellcome, who have spared no pains to carry out my suggestions, and took the trouble to send especially to England to prepare the dressings for presentation at this Congress.

MODELS AND DESIGNS OF FIELD OPERATING WAGGON AND TENDER FOR MAJOR OPERATIVE WORK CLOSE TO THE FIRING LINE, AND TO TAKE THE PLACE OF THE PRESENT OPERATING TENT.*

By Captain P. FIASCHI, M.R.C.S. (Eng.), A.A.M.C.

SINCE this Section met in Melbourne in 1908, an interesting discussion took place at the latter end of the same year by the French Society of Military Medicine regarding that part of the surgical procedures which probably involves the greatest risk, and about which opinions are still at variance, namely, laparotomies on the battle-field, and I may also add now, the surgical attack on the thoracic cavities, having in view the recent marvellous surgical procedures that have been evolved within almost the past few months. I cannot do better than quote, verbatim, the very able review of the discussions of these surgeons by Dr. Milton Foote, surgeon to the City Hospital of New York, in his paper in "Progressive Medicine" of June, 1910, as follows:—

Billet and Douche admitted that laparotomy, while theoretically possible in an ambulance or field-hospital, is against the best interests of the wounded man. Toubert said that operation under proper conditions is not practicable. Sabatier advanced against laparotomies the additional fact that their performance caused neglect of many patients wounded in other portions of the body, who would be benefited by prompt surgical attention.

Ferraton, Reynier, Moty, and Gauthier made rather a feeble protest against the opinion of an overwhelming majority, when they advocated, in place of an extensive laparotomy, simple abdominal incision, combined with semi-erect posture and drainage.

* Abstract of paper presented by Captain P. Fiaschi at the Naval and Military Section, Australian Medical Congress, Ninth Session, Sydney, 1911. Full details, together with photographs of the exterior of the waggons and internal arrangements, with specifications and plans, will be found in the reprints of Captain Fiaschi's paper.

It is, I think, a safe prophecy that surgeons will not long be willing to stand aside and idly wait for the recovery or death of those suffering from gunshot wounds of the abdomen produced by the small calibre, high-velocity bullet; and yet, statistics compel them to do so, unless a better plan of treatment can be suggested than has hitherto been employed in war. Already Vaucresson has outlined such a plan. He would have one or more aseptic ambulances, virtually operating rooms on wheels, accompany each army. Each should have its operating staff. They should be stationed as near as possible to the firing line, and should only handle patients with gunshot wounds of the abdomen. Such patients should be brought to them as speedily as possible, preferably by automobile ambulances. After being operated upon they should be placed in a suitable field-hospital or tent reserved exclusively for them. Perhaps in some such way as this the military laparotomy may be freed from the odium at present attached to it.

In looking up some of the recent literature for Colonel Fiaschi in 1908, on gunshot wounds of the abdomen, especially that dealing with the experiences of both the Russian and Japanese surgeons in the Russo-Japanese war, it occurred to me that probably one feature might be elaborated to assist the military surgeon, operating under the most disadvantages circumstances on the battle-field—that is, to provide him with as perfect a movable operating room as possible, and on speaking to the Colonel on this point he also thought the matter could be worked out. As you can see from the review of Dr. Foote, the French surgeon Vaucresson has already expressed such an idea. A distinguished American surgeon, Howard Lillienthal, once truly said, "The operating theatre or operating room is the surgeon's workshop, and that is where his work should be done." Now, if this statement applies to civil life, it is only fair that the military surgeons should be provided with equally as good a workshop, and I have in mind not only operations on the abdomen, but on every other part of the human body which may be involved, carried out in an operating waggon that will supplant the operating tent entirely. For these reasons I bring before you these rather crude models, which may perhaps serve as an idea as to what a more comprehensive apparatus might be evolved from, and if only in producing a discussion on this point you may ventilate your opinions they will have served some purpose.

Let us consider, first, what motive prompts us to improve on the operating tent now in vogue. What are the advantages of the operating tent compared to the movable operating waggon? This can be answered only by saying that there is more space in the tent. However, even the greater floor space is discounted by the sloping roof, which soon limits the movements of men of the stature of many of us here present. Furthermore, the two poles which support the ridge of the tent limit the most valuable part of the floor space—that is, the centre of the tent. What are the disadvantages of the operating tent?

First: The tent, together with its paraphernalia and equipment, has to have its own means of transportation—that is, cart or wag-

gon; it takes time to pitch the tent and also to strike tent. It may have to be pitched on damp ground, which is soon made worse by the slopping of water, solutions, and secretions of the patient incidental to every surgical procedure.

Second: When once pitched it has to be equipped. The panniers have to be unpacked, the table set up, arrangements made for the surgeon and the assistants to wash their hands. Facilities for setting out the instruments, dressings, ligaments, and suture materials are poor. Hot water has to be prepared for the solutions, as also for boiling the instruments. This brings up the matter of the probable deficiency of fuel, which has been known to occur.

Third: It is needless to remind you of the bad natural light for operating that obtains in a tent, leaving out entirely the matter of supplying suitable artificial light. As far as we know, there is no suitable apparatus existing for transmitting natural light through the roof of a tent compatible with its safety in transportation.

Fourth: The difficulty to avoid draughts, and also to keep the dust and flies out.

Fifth: The difficulty in heating a tent, and, as you know, heat is one of the most potent factors in preventing surgical shock.

Sixth: The instability of a tent in a gale of wind, together with the bellying of the roof or the flapping of a side.

Seventh: The total absence in the present operating tents of complete up-to-date water, instrument, and utensil sterilising apparatus, without which it is almost useless to attempt that great surgical desideratum, primary union. When modern surgery goes abroad, her trousseau is an extensive one, and of her essentials none is more important than the sterilising apparatus.

Eighth: When the field hospital moves on the operating tent, together with the other tents, has to come down; the repacking of the paraphernalia, loading of the waggons, again takes place, and de novo the whole vicious circle of the one element which is indispensable to any surgeon to carry out a rapid clean surgical procedure, which may be the means of saving some or many brave fellows' lives. There are other disadvantages that I will not go into, but which no doubt occur to all of you.

Now, before going into the qualities of a field operating waggon and its tender, such as these models are meant to represent, I will give a brief description of each. They consist, first, of the operating waggon proper; and second, another waggon, the tender. In each case the measurements are as follows:—

Length inside, without driver's boot, 14 feet.

Width of floor inside, 6 feet.

Width 18 inches from floor, 6 feet 8 inches. (This is due to the counter that is given to the sides when above the level of the tyres.)

Height at sides, 7 feet.

Height at centre, 7 feet 6 inches.

Track of rear wheels, 7 feet.

Height of floor of each waggon from ground, same as ambulance waggon, Mark I.

Lighting facilities are obtained by overhead skylights or transoms, 6 feet by 4 feet and 3 feet by 2 feet, covered with wire glass, as used for motor-car shields.

Attention is called to the method for covering over the skylights so they will not be damaged in transit, or when the waggon is not in use, by means of water-tight shutters.

Each waggon has two side doors with windows, and one rear door with windows. In the case of the operating waggon the rear doors are almost the full width of the waggon, to give more light for any operation directed on the perineum, the light then coming from behind the operator.

The windows of each of the doors are intended to be double windows similar to those of a Pullman car, which, as you know, resist even the fine dust of the great alkali desert. On the outer side of the door is a shutter to protect the windows when not in use.

To facilitate the landing and removal of patients an adjustable landing-stage of wood has been arranged at the rear of the operating waggon 8 feet in length, 5 feet 6 inches wide, which is quickly taken down and packed up when ready to move on. This stage is carried in the waggon.

Ventilation is provided for by movable cowls similar to those of a ship, which can be turned to the wind or against it, and ventilators at the lower part of the sides made fly-proof, together with electric fans.

The carriage proper is similar to that of the regulation ambulance. The boot would contain a locker, in which the necessary waggon requisites of the waggon would be carried—that is, lifting-jack, axe, and hook rope, steel wire, harness, &c., &c.

Coming to the internal furnishing of each waggon, and commencing with the operating waggon, it would contain:—

1. One water-tank of 60 gallons capacity, with semi-rotary feed-pump.
2. Two sets of water sterilisers of 6 gallons capacity each. These would be for the hot and cold water for washing the hands. The water steriliser would be of the Bramhall, Deane type, high-pressure—that is, sterilising at 250 degrees Fahrenheit, and heated by petrol. No steriliser is worth considering unless it can sterilise water at 250. There is a real difference between boiled water and sterile water, and this is even more important to us, considering that in active service many of the sources are contaminated.
3. Three wash-basins, with sink, Howard Kelly pattern. This pattern of basin ensures an economical use of sterile water.
4. Immersion bowls for the arms, allowing the whole arm up to the elbow to be immersed in antiseptic solution.
5. Stock solution bottles carried in racks over the immersion bowls.
6. Instrument table, movable, and four adjustable tables attached to sides of waggon.

7. Modern operating table, giving the Trendelenberg reversed, Trendelenberg for operations on the skull, face, and neck, which greatly diminish hæmorrhage; and the Lillienthal bridge for kidney and liver work. Length of table, 6 feet; width, 18 inches.
8. Stools, and bowls for surgeon's hands.
9. Electric lights.
10. Oil tank for petrol, which is used for heating sterilisers, holding 25 or 30 gallons of oil, and placed between front and rear wheels on under side of waggon floor.
11. Floor of wood, covered with sheet rubber or high-grade linoleum.
12. Formalin generator, modern type, for disinfecting waggon after septic cases.

The internal furnishings of the tender would consist of:—

1. Water-tank, 60 gallons capacity, with semi-rotary feed-pump from outside.
2. Two sets of two 10 gallons each high-pressure water sterilisers for hot and cold sterile water.
3. Utensil steriliser for basins, dishes, and jugs.
4. Instrument steriliser.
5. Two dressing sterilisers. These would probably be little used for sterilising dressings, as dressings would be supplied in sterile packages, but could be used if wanted, or when at a stationary hospital, or for dry sterilisation of gloves.
6. Small dynamo operated by small oil-engine; also a small accumulator in case of a sudden accident to the dynamo. This dynamo would supply the lighting and heating of operating waggon and tender, and also electric fans. (It is only necessary to bear in mind how the men who travel round the country with a moving-picture outfit operate their dynamos from the engine of their motor-car to appreciate the value of what electric light would be to a surgeon.)
7. Instrument, dressing, and apparatus lockers and drawers, the instrument drawers being arranged with a complete set of instruments each, such as a drawer for craniotomy, another for thoracotomy, another for amputations and disarticulation, another for laparotomy, another for eye instruments, and so on. In these lockers would be accommodation in special racks or fiddles for the bottles of drugs necessary for surgical work—that is, antiseptic solutions for stimulations, anæsthetics, solutions for cleaning the skin, and general supplies of a modern operating room. The dressing lockers would contain a complete line of sterile or antiseptic dressings, also surgeon's gowns, sheets for operating table, &c., &c.
9. Sinks for washing instruments, basins, &c.
10. Oil tank for petrol, placed under floor, containing 25-30 gallons, similar to tank of operating waggon for heating sterilisers and working engine of dynamo.

Construction.

This would be of sheet-metal on an angle-iron frame. Wood sides and top would not be safe on account of danger from fire. The difficulty of the waggon becoming very hot could be arranged for by a good system of ventilation and an electric fan, although it must be borne in mind that, while the heat is uncomfortable to casual operators, most surgeons who have been some years operating are not at all affected by the heat of operating rooms, and many prefer them to be hot on account of the great loss of heat the patients sustain when under the narcosis.

Personnel.

1. Surgeon.
2. First assistant.
3. Anæsthetist.
4. Medical officer to pass instruments and ligatures.
5. Two waggon orderlies (expert hospital operating room orderlies).
6. Drivers.

Method of use.

The two waggons would be drawn up parallel with each other, the tender on the near side of the operating waggon, the small bridge adjusted between the side doors of the waggon and tender, and a canvas covering used to cover in the connection between the two waggons—that is, to cover over the small passage-way between the waggons, in this way making the tender an annex to the operating waggon.

The landing-stage would be fixed up to rear of operating waggon, on this the stretcher-bearers would deposit the patient, the personnel of the operating waggon then taking charge of the case. As the operating waggon orderlies would have taken care to have previously sterilised the water in the boilers of both waggons, given a very urgent case all that would be needed would be to heat up one or two of the boilers to 150 deg., which would not take very long, boil the instruments required, and set out the dressing utensils, &c., the same as they would do in the operating room of a general hospital.

It is understood that the orderlies would not lose any opportunity to fill up their water-tanks from the best source they could command at any point the column might halt or bivouac. The semi-rotary feed-pumps would permit the waggons being drawn alongside a water-hole and their tanks replenished. In the same way care would be taken to sterilise the water in all the boilers at any halt or bivouac, so that there would always be a supply of sterile water. As can be seen, by having a double set of hot and cold water sterilisers in each waggon, even in a continuous period of work the water from one set could be made use of while the other set, which had been used up, could be refilled from the water-tank and sterilised. The duplicate sets would also be of service in case of

accident or breakdown to the other set in the same waggon. In the same way the basins, jugs, bowls, &c., of large size would have been sterilised in the large utensil steriliser, and the lid of the steriliser shut down tight; these basins, &c., could be placed in wire cages and left in the large utensil steriliser while en route, so that should they be wanted at any time it would not be necessary to boil them up. The wire cages would prevent them from banging about.

Disadvantages of Waggon and Tender.

1. Limited space. To an expert surgeon, with expert assistants, this would mean very little, as there are all the other compensating facilities.
2. Weight of waggons. The operating waggon works out at about one ton and three-quarters.
3. The tender would weigh $2\frac{1}{2}$ tons, on account of its greater water supply and locker space, containing the supplies and apparatus.

Advantages of Waggon and Tender.

1. After any operation, once they are cleaned up they are ready for business again. There is no pitching tent or taking it down. They are self-contained, and can move off with the column just as quick as any other waggon or gun.
2. Operations can be done with a good light overhead, and lateral, natural, or artificial.
3. There is a good clean floor. If an instrument falls on the floor there is no fear that extra precaution may have to be used to disinfect it on account of tetanus.
4. The surgeon is in his own workshop, and knows just what his armamentarium consists of, and where everything that he may require for a given procedure is to be found.
5. Operations can be done under most favourable conditions, and the technique of all can be beyond reproach, because there are the facilities for complete sterilisation of the surgeon's and his assistants' hands, of the patient's skin, of the instruments; and the dressings cannot be contaminated.
6. The two waggons can be made fly-proof; no blow-flies or other flies which have just come off a patch of excrement, and whose legs are a veritable inoculating loop of colon bacilli, can breeze in and out as they like.
7. It does not matter how hard the wind blows outside, or how cold it is, or how wet, the waggons are rain and wind-proof, also dust-proof.
8. Once the lockers are filled up there is no scrimmaging around to find some particular dressing or apparatus, or chasing around the instrument boxes for some urgently required instrument. There is no repacking of panniers, and panniers being lost or damaged; everything goes back into its place, and can be immediately found.
9. The waggon and tender can be brought very close to the firing line—a most important feature.

10. Given that a stationary hospital is pitched, and an operating room is made out of a school-room or church; the benefits of having the tender, which can be brought right alongside the building, and given a good supply of sterile water, instruments and utensils sterilised in a reliable apparatus, without having to improvise or secure the necessary apparatus, needs no comment. For the same reason the dynamo in the tender could be made to light up a good big stationary room if necessary. It may also be mentioned that the dynamo could also be utilised to operate a small coil for skiagraphic work, or to screen a case.

11. That with the operating waggon and tender as above outlined, there appears to be a possibility for military surgeons to carry out surgical procedures which heretofore they were unable to do on account of the lack of proper facilities. No doubt many of you present have been only too conscious of what should have been done to certain cases in the South African campaign, but on account of existing conditions and difficulties knew that their best chances lay with non-interference, as to attempt to carry out operative measures would only court certain and fatal disaster. The value of such a waggon for the work one encounters in every-day life is not to be estimated.

The following fact must be emphasised with regard to the personnel of these waggons: that is, the operating waggon orderlies should be experts in the same way as the operating surgeons are experts in civil life. Unless a man has been accustomed to the technique of an operating room of a general hospital, and has a clear conception of aseptic and antiseptic procedures, he would be more of an encumbrance than assistance to the surgeon in the limited space of both waggons. I am perfectly safe in saying that it takes as many years to make a competent and reliable operating room orderly as to make a general surgeon.

HOW FAR IS MOMBURG'S AORTIC TOURNIQUET APPLICABLE TO MILITARY SURGERY?

By COLONEL T. FIASCHI, M.D., D.S.O., V.D.

THIS method of hæmostasis was entrusted to surgeons by Momburg in 1908.

For those who may not be familiar with it I shall quote from Gerster¹ the description of it:—

The patient is placed in the Trendelenberg position. The end of a piece of soft rubber tubing, having the thickness of the index finger and the length of about 4 feet, is passed through under the back of the patient to be grasped by the hand of an assistant who stands at the opposite side of the operating table. This tube is then stretched to the utmost, and thus stretched, is passed by the surgeon midway between the border of the ribs and the iliac crests across the abdomen to the other hand of the assistant, whose duty it is to maintain tension. The free end of the tube is now led back under the patient by the surgeon and is again put on the stretch, the assistant in the meanwhile gradually releasing the bite of the stretched tubing, which now firmly encircles the waist. While this is being done another assistant places a finger on the femoral artery to ascertain the moment of the cessation of the pulse. Observing the same steps, two, three, or more turns of

(1) Gerster.—Progressive Medicine, Vol. 2, June, 1911, page 69.

tubing are exactly superimposed until the femoral pulse disappears. In slim individuals two turns will suffice; in fat or muscular ones, as many as six may be necessary. As soon as the femoral pulse is suppressed the ends of the tube are crossed and secured by forceps or ligature. After this is done constrictors are applied to the thighs below Poupart's ligaments, and to the legs below the popliteal spaces. As soon as the operation is finished and all the vessels have been secured by ligatures, the rubber band encircling the waist is removed. Directly after this the other rubber ligatures embracing the thighs and legs are untied one by one. The object of this is the gradual extension of the scope of the circulation and the avoidance of a too sudden demand upon the efficiency of the heart muscle. By this switching on of one segment of the circulatory system after another, the readaptation of the heart to the changed conditions is gradually effected.

I have had occasion to try this method twice on the same patient. A case of advanced tubercular disease of the upper end of the femur and of the acetabulum, extending to the pubes and to the iliac bone. This I treated by the intra-iliac amputation done in two stages. The first time I amputated the limb at the hip joint. I had previously put on Momburg's aortic tourniquet exactly as described. The patient being a woman not very fat, two turns of the tubing round the body were sufficient to stop all pulsation in the femoral artery. No hæmorrhage whatever took place during the amputation, and we were able to secure all the vessels with the greatest leisure and security. We released the aortic tourniquet first, then after a little time the elastic band that we had put on the opposite sound limb. No circulatory or intestinal trouble whatever followed. About six weeks after we proceeded to the second stage. Momburg's aortic tourniquet was again applied, and the more severe operation of resecting one-third of the ileum, the whole of the ischium, and the greater part of the pubes was performed. The patient made a good recovery without further disturbance even after this, and although an almost gaping wound has not quite healed yet, she is still alive and gradually improving.

From the manner in which Momburg's aortic tourniquet acted in this case I have no doubt about its very great value as a measure for controlling all hæmorrhage in the pelvic vessels. The question before us is: "How far can we apply it on the field in cases of severe pelvic hæmorrhage?" Naturally, any hæmorrhage of the vessels of the limbs below the groin can be controlled by Esmarch's tourniquet, but in severe hæmorrhage of any of the pelvic vessels we have been so far without any means to prevent a wounded man from dying of such hæmorrhage. I think that wherever it would be possible to bring any such wounded man to surgical aid within three hours, the use of Momburg's method would give him a chance of having his life saved.

The dangers of such a procedure are, first, sudden great lowering of the blood-pressure after releasing the tourniquet; second, injury to the intestine, which may be subsequently followed by gangrene of it. The first can be prevented by the use of the Trendelenberg position when the tourniquet is applied and the use of a bandage or constrictor to each limb so as to retain portion of the blood in them when the aortic tourniquet is removed. These constrictors are gradually removed afterwards, and the disturbance of the circulation is not so great. The second danger in ordinary practice is prevented, first, by careful emptying of the bowels beforehand, and by

causing the mass of the bowel to fall towards the diaphragm, by placing the patient in the Trendelenberg position. I think that on the field it will be difficult to prevent this injury to the bowels altogether; but considering the absolute hopelessness of these cases if left to themselves I think that this danger should not be an absolute bar to the use of such a valuable measure. Furthermore, Mayer² states that since April, 1909, the number of cases of hæmostatis by Momburg's method recorded are almost 200, and of these in two cases only did injury to the bowel occur.

Is the absence of anæsthesia an obstacle to the successful carrying out of this method? It has been adopted fairly largely by obstetricians in cases of post-partum hæmorrhage, and with marked success, stopping not only the hæmorrhage, but causing a prompt contraction of the uterus. Many of these cases were not in a state of general anæsthesia. Dr. Rudolph Matas,³ of New Orleans, made an experiment with this method on eight of his students, who volunteered for it. None of these were anæsthetised, and their ages were from 17 to 25 years. It was found that the muscular tension and resistance of the abdominal walls was much greater than that of the relaxed anæsthetised patient. Two to four turns of the elastic constrictor, heavy gas tubing, were required round the abdomen before the wasp-like waist could be obtained, and before the femoral pulses disappeared at Poupart's ligament. All the students appeared to be somewhat collapsed when the femoral pulses became obliterated, but no permanent ill-effect followed in any of them. Owing to the possibility of cardiac trouble following in cases where the myocardium is weak and degenerated, it stands to reason that application of this method to men past 45 would be attended by considerable risk. Considering, however, that the greater number of soldiers are young and picked men, this objection would not apply to the generality.

I think it advisable to have all stretcher squads supplied on the field with a suitable tubing for the carrying out of this method, and that all stretcher-bearers should be trained to the careful application of Momburg's aortic tourniquet. However, as a general rule I do not think it should be applied unless a medical officer is present.

Every exhausting factor should be eliminated as far as possible. Pain in cases of operation should be relieved as completely as morphine will admit, as soon as the diagnosis has been made, especially in acute abdominal cases. Fear of operation should be reduced to a minimum by morphine or some soporific. When morphine is to be used prior to the administration of chloroform, it should be remembered that morphine depresses the function of the respiratory nervous mechanism. By sufficient dosage of morphine, in the case of dogs, this depression is sometimes as marked as that of vagotomy. Morphine, therefore, for such purpose, is contra-indicated in any condition of defective lung ventilation.

During operation the body heat should be carefully conserved. In winter time, especially during prolonged operation, the addition of heat is necessary. Both shock and anæsthesia derange the heat-regulating

(2) Mayer.—*L'Hemostase preventive de la moitié inferieure du corps suivant la technique de Momburg* Journal de Chirurgie, Vol. 4, 1910, page 121, et seq.

(3) Matas.—*Transactions of the American Surgical Association*, 1910, Vol. 28, page 622.

mechanism. Under experimental conditions the onset of shock is much delayed by keeping the animal immersed in a saline bath at body temperature. Loss of blood should be kept within the lowest possible limits; whilst dragging on, handling or exposing the abdominal organs should not be more than is necessary.

In addition to what has already been said about anæsthetics, it should be remembered that the mode of administration has much to do with diminishing shock. The more perfect the anæsthesia in the earlier part of the operation, and the lighter it is—consistent with effectiveness—during the after part of a prolonged operation, the less will be the degree of the resulting shock. In operation upon cases already shocked, light ether anæsthesia is to be used, and in bad cases with the patient in the Trendelenberg position.

Remedial.—There are four indications:—

1. Ensure physiological rest by stopping the continuance of the cause.
 2. Maintain the body heat.
 3. Endeavour to secure some constriction of the blood vessels.
 4. Assist the return of venous blood heartward.
1. Operations should cease before depression has become too great. In non-operative cases pain should be relieved by general and local treatment, as in fractures, lacerations, severe burns, &c. Mental rest should be secured in cases of great grief.
2. Heat added by means of hot-water bottles or bags is a familiar method. A better way is that mentioned by Waterhouse (10). It consists in the use of carbon filament lamps beneath the bed coverings, which are supported on a cradle. This gives uniform warmth to the entire body, and it is very easy to regulate the temperature. It is a common laboratory method of maintaining the body heat of animals during experiment.
3. We have remedies for raising the arterial pressure in the unshocked, all of which lose this property more or less completely and rapidly in progressively deepening shock. Excepting strychnine, all of them produce their effects by acting locally upon the arterioles. Strychnine, as is well known, produces its pressor effects by stimulating the central nervous mechanism of the vaso-motor system. Crile (11) first showed the inconsistency of using strychnine in shock. He proved that it was worse than useless, because it produced depressor effects in shock, if any effect were caused at all. The employment of the other agents is based upon more rational grounds, since they act independently of the central nervous system. Ergot products are useful only in mild shock. The preparations which I have used experimentally have failed completely in moderate and severe shock. The same statements apply to pituitary. The pressor effect of this substance is more lasting than that of ergot, but its depressor quality comes more into evidence as the pressor effect passes off. Both pressor and depressor actions pass off in profound shock. When we come to adrenaline, epinephrine, and, doubtless, all of the amines (12), we find them producing their pressor effects far into the condition of profound shock, but, unfortunately, the duration of the rise of pressure is brief. This drawback may, to a

certain extent, be overcome by slow but continuous infusion into a vein of 1 in 100,000 adrenaline hydrochloride in isotonic salt solution at body temperature, the pulse being used as a guide. Lockhart Mummery (12) has employed the rather indefinite method of leaving some of the solution 1 in 20,000 in the abdominal cavity. Care is necessary, however, in using these pressor substances in profound shock. I have found them arrest the heart permanently in conditions of deep shock, although the quantity administered was not more than a moderate dose for the unshocked dog.

Summarising these results—the employment of strychnine in shock is irrational, whilst that of ergot and pituitary is only indicated in mild and moderately severe cases. They are useless in severe shock. Adrenaline, epinine, and doubtless other amines are very useful when used as mentioned.

4. Assisting the venous return.—This is best accomplished by raising the trunk considerably above the level of the head, thereby aiding the velocity of venous blood-flow by gravitation. In the case of fat patients, and those with enfeebled respiration, the elevation should be intermittent, and not too long at each period. Oxygen may be needed, especially in such cases. The firm application of an abdominal binder is also of much service in assisting the venous return. Crile's pneumatic suit is of still more service, but it is rarely available. By these means the right ventricle is more readily filled, and the medulla is better supplied with blood. Assisting the return of venous blood heartward seems to me to, be the most reliable and efficient measure of treatment in all forms but especially in profound shock, in which other remedial measures afford so little help.

The intravenous injection of isotonic salt solution at body temperature is useless in profound shock. A plethoric rise of general blood pressure may be induced in this way, but it is only temporarily sustained. The fluid rapidly passes out into the tissues, producing general and often pulmonary œdema. This also occurs, but less rapidly, in the lesser degrees of shock.

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XI.

SECTION OF DERMATOLOGY, RADIOLOGY, AND MEDICAL ELECTRICITY.

PRESIDENT'S ADDRESS.

By HERMAN LAWRENCE, M.R.C.P.

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THAT radium therapy is of immense value in the treatment of skin diseases is a fact recognised by all dermatologists. But when should radium therapy be adopted in the treatment of skin affections is a matter not yet definitely decided upon; only a few dermatologists up to the present have had sufficient practical experience in this branch of dermatological therapeutics to enable them to speak with authority upon the matter. Only two or three books have been written upon the subject, and the experiences detailed by these authorities show that even they, after considerable experience, differ at times considerably in their opinions as to when and where this method of treatment should be used.

At the Adelaide Congress, in 1905, I read a paper dealing with some of the cases I had then treated with radium. At that time I had only some 15 to 20 milligrammes of radium bromide; but since that date, owing to the useful results I had obtained in the treatment of some intractable conditions of skin diseases, I gradually added 100 milligrammes of as pure radium bromide as I could obtain to my supply. Of the cases mentioned as being apparently successfully treated, at the Adelaide Congress, was a very extensive case of rodent ulcer affecting the forehead, nose, cheek, and upper and lower eyelids of the right eye. I mentioned that this case had healed up entirely under radium treatment alone, and the cosmetic result was perfect, it being difficult to believe that a disease which was so extensive and so disfiguring in healing could leave so little trace of its previous existence. I had the opportunity of seeing this patient occasionally for at least three to four years after that treatment was carried out, and the parts remained quite well, no further treatment being given to the part. I mention the fact that no further treatment was given to the part, as in my practice now I am a strong believer in after-treatment, in certain diseases, being practised in radium therapy, whether there be any sign of a return of the disease or not. I will now pass around a moulage taken of this case

several years after the patient had remained quite well of this trouble. This case serves to illustrate my experience in a good number of cases of rodent ulcers treated in my private and public skin clinics. In this case I will mention the fact that the patient discovered with great pleasure that with the disappearance of the disease of her skin, another, to her, most pleasing incident occurred, namely, that her sight, which had become markedly blurred to the extent that she could not read or sew during the growth of the rodent ulcer, had become quite normal again. Dr. Percy Webster, of the Eye and Ear Hospital, Melbourne, kindly examined this patient at this time, and said that he was of the opinion that the radium therapy had probably produced some reaction, which had caused the blurred sight to disappear, as it had done in the case of her skin trouble. This was, of course, in the early days, before the splendid results of radium therapy in the diseases of the eye had become recognised. The improved condition of the sight was also maintained up to the last time I saw or heard of the patient.

I have of late years, at the request of several oculists in Melbourne, treated a good number of eye cases. Of these cases I might mention one in particular, namely, a case of papilloma of the cornea. This patient, as you will see in the photograph I now show you, had an extensive epithelioma of the nose, which very quickly disappeared under radium therapy alone, and has kept well since. At the same time, I would draw your attention to a greyish-coloured formation which you will notice had formed over the pupil of the left eye. Dr. Edward Ryan, oculist to St. Vincent's Hospital, removed a portion of this growth and took the specimen, and also got the patient to accompany him, to Dr. R. J. Bull, Director of the Bacteriological Institute, Melbourne University. The specimen was pronounced to be a papilloma, a very rare disease of the eye. The patient stated this growth had been gradually forming for some months, and Dr. Ryan reported his vision as $\frac{6}{60}$, the sight being very much impaired. I then treated the papilloma by medium intense radiations, cross-fire, from 20 milligrammes of pure radium bromide, fifteen to twenty minutes' exposures. The formation quickly disappeared, and within six weeks of the first treatment Dr. Ryan reported that the growth had entirely disappeared, and that the sight was, considering his age, normal. In a short address, as I am now communicating, I can, of course, only mention a case here and there in order to illustrate the method of treatment adopted, and the result obtained.

Norman Walker, of Edinburgh, has said of the X-rays in the treatment of skin diseases, that he considered the X-rays the greatest therapeutical agent ever yet introduced into the domain of the dermatological armamentarium. And I think most dermatologists will agree with Norman Walker that if a judicious selection of cases is made, and the X-rays treatment is carried out with judgment, not only thinking of the immediate improvement to be obtained by this method of treatment, but remembering well the untoward results which may develop after X-rays treatment, even sometimes when the dosage has not been excessive at any one particular exposure,

then with these necessary precautions I think we must agree that X-rays therapy is beyond doubt of the greatest value in the treatment of cutaneous diseases. And I would say that of no less a value has been the later discovery of radium as a therapeutical agent in the treatment of skin affections. But here, again, as in the case of the X-rays, a judicious selection of the cases suitable for this form of treatment is absolutely necessary. And a knowledge of the variety of therapeutical action of radium necessary in the particular disease chosen for treatment is just as necessary. Radium therapy will remove from sight, and so to speak cure, many forms of skin affections, but it by no means follows that radium therapy is the correct method of treatment to adopt in all such cases. For instance, some two years ago I treated a case of granuloma annulare with radium; the disease disappeared, and the part remained well, and there has not been any return of the trouble. This case had been under a good deal of treatment by ointments, &c., without success. Another case of granuloma annulare occurred quite recently in one of my skin clinics. I treated this case with solid carbonic dioxide, and the result was just as successful as in the case just mentioned treated by the radium. But by the freezing method the disease was cured in a few days, as compared with two or three weeks in the former case. The disease is, of course, a very uncommon one; but from this limited experience in these two cases I should think the later method more suitable.

In the treatment of nævi, I consider that radium therapy is at present one of the most successful methods of treatment we can adopt. But when we speak of nævi we speak of a disease which occurs in a great variety of forms, and of these varieties of nævi I consider a great number, though curable by radium, by no means are best treated by this agent. And not only must a case of nævus be selected as suitable for radium treatment, but the method of radium treatment to be adopted in that particular case must also be studied. Take, for instance, a nævus flammeus (capillary nævus) situated upon the face in a young child. There the cosmetic result must be our first aim, and I think radium therapy must take first place in such cases. In these cases I prefer to use medium intense radiations from fairly strong radium specimens. The interceptors being not more than a mica covering and one layer of lint, if 10-milligramme specimens are used covering an area of 1 centimetre square, then I give forty to sixty minutes exposures, over the whole area, in a child as young as 2 years of age. The treatment is carried out weekly, unless the results obtained suggest an alteration in the treatment, which may be either to increase or lessen the dosage. As a good cosmetic result is the chief aim, the saying that "Patience is a virtue" must be our motto. I often leave cases which are doing well, as regards the deformity disappearing, for a month or two at a time, in order to get the full result of previous treatment before pushing on with the treatment. And my experience is that in this particular form of nævus the final result of radium treatment is the best obtainable by any at present known method of treatment. But with the cavernous nævus, especially if situated upon the body, then, although long, persistent radium treatment would cure the trouble.

I now prefer the more rapid result obtainable by the freezing methods of liquid air or solid carbon dioxide. However, if the cavernous naevus is upon the face, especially in a female infant, one must again aim at getting the best possible cosmetic result, and then the question of radium treatment must again be considered. In these cases I prefer to adopt the method of using the hard beta and gamma radiations from strong radium specimens well protected, and, if possible, to cross-fire with the radium specimens through the structures to be got rid of—that is, the radium specimens have interceptors, including a leaden protection one-sixth inch in thickness, with paper pad and lint next to the skin. These applications are from two to three hours in duration, and applied weekly, the results obtained guiding one as regards the future treatments. In some cases I have combined the freezing methods with radium therapy, and if this combined method is carried out then I found it advisable to, as far as possible, carry out the treatment by the freezing method before radium treatment is applied, or when the radium radiations have produced their effect upon the structures, the usual thawing of the parts after being frozen may not occur as it should do, and ulceration be produced.

In tubercular disease of the skin, particularly lupus vulgaris, radium-therapy has given me excellent results. If the disease is an extensive one, and particularly if there is active ulceration, I generally give some general X-rays exposures to the part, in order to clear up some of the condition due to chronic inflammation, and then apply (lupomata), which are easily discernible with the pressure of the convex glass. The results I have obtained in lupus vulgaris are very good, and many of the cases have remained well when cured by this method of treatment. The moulage I now pass around shows the splendid cosmetic result obtained in a case of lupus vulgaris of the nose which had been treated for many years by surgical measures.

I have not the time to enter into the question of the relative values of the X-rays therapy and radium therapy. Both methods of treatment are in constant use in my skin clinics, but at the same time one must recognise a difference in the therapeutical value of these two agents in certain cases.

I might here mention a case of epithelioma which had attended at the X-rays department of one of the hospitals, and in which that method of treatment having failed the patient was recommended to have the growth removed by excision. The patient, however, asked me to try radium treatment, and after two or three applications of the medium intense radiations from fairly strong specimens, the growth quickly disappeared, and has not since returned, it now being some four years since the radium treatment was carried out. One, of course, must remember that in the radium radiations you have the medium and hard beta rays, which no doubt play a very important part therapeutically, and their action is probably independent of the gamma rays, which latter correspond to the X-rays. To many country practitioners a good specimen should be invaluable, as the

radium specimen is always ready for use, and not, as in the case of the X-rays, dependent upon accumulators or an electric current supply. By using several radium specimens at a time I find I am relieved of a lot of tedious treatment by the X-rays.

The dosage from radium specimens can be well and surely regulated. Then there is the advantage of being able to apply the radium radiations to parts practically inaccessible to the X-rays treatment.

Now, when one comes to the treatment of malignant disease by radium therapy one must, for several reasons, consider the subject from the point of view of the advisability of this method of treatment being adopted in any particular case.

In the British Medical Journal of 22nd July, 1911, is a very able and interesting article by Drs. Paine and Nicholson of work carried out at the Cancer Hospital Research Institute. They have shown that when mice have been experimentally given a certain form of cancer, and have then been submitted to surgical treatment, the malignant growth not being completely removed, that the growth has regrown with increased malignancy, and that the mouse has died sooner than it would have died if the operation had not been performed. In some cases in which the mouse has had two malignant tumours, and one of the tumours was operated upon and the other left, the malignancy of the returning growth of the tumour operated upon was altogether greater than the growth of the tumour not operated upon. The results of such experiments, together with our practical knowledge, must necessarily lead to deep thinking as regards surgical interference in some forms of cancer. I recognise the great value of surgery in malignant disease, but at the same time, as it so frequently fails hopelessly, we must not hinder any experimental work which may lead to some better and more hopeful means of combating this at present incurable disease.

I consider radium therapy is of great value in some inoperable malignant conditions, and occasionally most surprising results have followed as regards the successful results obtained by radium treatment. The radium radiations, if sufficiently strong, and applied efficiently, have frequently the power of altogether improving the status quo of some inoperable malignant conditions. Pain is relieved, discharge lessened, and the rate of progress of the disease lessened, or even held in check. These are advantages for which the poor patient is not slow to acknowledge his appreciation of same. And even if the radium treatment may only very occasionally produce more than these results surely they are sufficient to make this method of treatment a desirable one. I will, in conclusion, just mention one or two cases in which radium therapy has given good results in advanced malignant disease.

The moulage I now pass around was taken of a case of sarcoma, endothelial type; a section from this case was examined, and pronounced as above by Dr. Mollison, Pathologist to the Melbourne Hospital. The condition, though extensive and with deep fixation, has now apparently entirely disappeared, and there is no evidence to sight or on palpation of the previous disease. It is some twelve

months since the patient first came under my care. I do not say the patient is cured, but the case was brought to me as inoperable, or as unsuitable for operation. The growth was extending fairly quickly at the time, and now, twelve months afterwards, there is no trace of the disease. The condition may, of course, relapse later on; but if excision of the growth had been practised twelve months ago, what would be his condition to-day? I think it very difficult to say, and at any rate he could not be any more free from the disease than he is at the present time.

I might also mention a case of a very extensive fungating epithelioma of the head in a lady 82 years of age. The patient was sent to me by a surgeon for radium treatment; he stated that the condition was inoperable owing to the great age of the patient and the extensive area of the growth. Within one month the pain, discharge, and discomfort of the growth had gone, and within four months all traces of the disease had disappeared. The patient lived to the age of 87, and died of cardiac failure. There was not any return of the growth; in fact, the patient lived for five years entirely free from any trouble whatsoever as regards the malignant growth she had been troubled with.

Another interesting case I may mention, at present under treatment. A lady, aged 72 years, was brought to me for radium treatment in February of this year, with an epithelioma upon the back of the hand. But, after consultation, the surgeon who brought her to me, at my suggestion, excised the growth; the operation was performed very thoroughly. Within three weeks the growth returned at the extreme edge of the scar left after the previous operation. Excision was again practised, with every precaution to obtain the whole of the growth; and again, within a month, a further regrowth of the disease occurred. The patient was again brought to me for radium treatment. After four weeks' treatment the return growth has retrogressed, and the part looks healthy; but there is ulceration from the intense action of the radium. I cannot at present say what the future result will be. To act against the disease developing in the glands of the axilla a thorough exposure to radium radiations was given to the whole of the glandular area of the axilla.

Such results as these just mentioned should lead one to hesitate before pronouncing against radium therapy in all malignant conditions. In the short time at my disposal it is, of course, impossible for me to go into the methods of radium treatment I have adopted in any particular case in detail. And I may say, in conclusion, that my experience in radium therapy, extending over some eight years, certainly leads me to consider that the utility of radium therapy, at any rate in the matter of the therapeutics of skin diseases, is second to no other agent or method of treatment ever yet introduced into the domain of dermatological therapeutics.

ACNE THE RESULTS OF A GENERAL BLOOD INFECTION.

By E. W. I. IRELAND, M.D., C.M.

IN this short paper I shall attempt to contribute my views on the origin of acne, which I have arrived at after observing a great number of cases and carrying on some bacteriological work during the past two years.

The elucidation of the causation of acne is more in the province of the bacteriologist than of the clinician, and, if so, with what fear and trembling should a general practitioner approach such a subject. I am only encouraged to do so by the fact that some general diseases are now being treated in London by vaccines prepared in the same fashion that I have been employing, and that long before the reports of the work done by others appeared. Finding my theories borne out in two or three such diseases, I make bold to lay before this meeting of dermatologists some ideas which I have not fully proved, but which I have no doubt will be soon found to contain some element of truth. My contention is that we should not consider the majority of skin diseases caused by micro-organisms as necessarily being localised to the skin surface. The vaccine therapy itself is a negation of such a belief, arriving, as it does, at producing a condition in the whole of the blood stream to do battle with a condition formerly considered as strictly a surface condition. In acne, as we are now taught, we have a double infection, the acne bacillus and staphylococci, and what we are learning from a paper in this section is the exact value of either or both in the production of the acne lesion.

In passing, may I suggest that the two may be complementary; that the limiting of the lesion to the sebaceous duct may be due to the presence of the plug of sebum, and that the particular form of staphylococcus that produces the nodule is encouraged in its growth, or enabled to become pathogenic by the presence of the acne bacillus. The fact that an attenuated diphtheria infection can be made virulent again by growth in company with the streptococcus pyogenes, makes it possible that the same relationship exists between the acne bacillus and the staphylococcus albus of the skin glands, seeing that the acne bacillus belongs to the same family as the diphtheria micro-organism.

Acne has always been a *bete noir* to the dermatologist. The treatment formerly was purely empirical. The number of remedies employed showed the futility of all of them; dieting was unavailing, internal medication generally useless, and external remedies sometimes induced a dermatitis in addition, without influencing the condition of the skin to any extent. In a bad form the disfigurement caused is often permanent, and resembles the pitting of variola to some extent. The age, of course, is usually adolescence; possibly, then because the skin glands become more active with the growth of hair, and so more liable to infection and growths of a pathogenic nature.

In my small experience the number of cases occurring in towns far outnumber those from the country, both from the greater liability to infection and to the artificial conditions of life diminishing the resistance.

Certain skins, in which there is probably an excess of sebum, are more likely to develop it; but, of course, the same would apply to seborrhœa, which is not nearly so prevalent.

It may be granted as an axiom that the embryonic cells in the majority of instances where there has been no syphilitic taint are naturally free from disease and resistant to the attack of most organisms—that is, if the human being could be grown in a germ-free atmosphere there would be no disease. The attack of multitudes of pathogenic organisms warring against the human race has produced two things: a passive immunity to the attacks of these organisms, and also a diathesis which is almost the exact opposite, a failure of perfect resistance to one or more particular organisms. In the adult human being—(1) the trophic energy of the nervous system; (2) the inherited or acquired immunity of the cellular elements and serum of the body; (3) and the mechanical resistance of the skin and mucous membranes to the entry of pathogenic genus protect the individual and preserve the race.

(1) Nervous System.—The patient whom we have been treating for acne with some success is suddenly faced with some crisis which causes shock to the nervous system; the acne appears (temporarily, let us hope) to have become worse than ever; over-fatigue and mental worry will lower the resistance to the *staphylococcus æreus*, a fresh crop of furmicles, or another carbuncle will appear.

(2) Immunity.—The natural, or acquired, resistance of the cellular elements, of course, is what we are more immediately concerned with, and I venture to advance a few suggestions as to the cause of the loss of resistance at a certain time of life.

The presence of a certain breed of organisms operating over a lengthy period certainly produces in many instances an ever-increasing want of resistance to that breed and to other organisms, not necessarily, as far as we know now, of the same family.

The tubercle bacillus lowers the resistance to the streptococcus, as does also the pneumococcus. The constant accompaniment to a tubercular ulceration of the lung is a pyogenic streptococcus; in fact, the cocci may sometimes be the invading or exciting organism, but practically always the secondary infection.

Before I took any interest in vaccine work I occasionally examined the blood of patients with a seventh objective, to get a rough idea of the condition of the cells. I was very much struck with the almost constant presence of some organisms actively moving about in the blood stream. In all cases few or many of these could be seen. In the dead condition, and on staining the specimen, they disappeared. I tried to grow these organisms from drops of blood taken from the ear and sown on agar, &c., but with no result.

For the past twelve months I have been taking 2 or 3 c.cs. of blood from the median basilic or cephalic, and incubating for forty-eight to seventy-two hours at 37 degrees C.

This is exactly the method pursued by some observers in England and elsewhere, and as a result of this blood-cultivation the blood vaccine therapy is now recognised as a brilliant addition to the weapons at our hand. The organisms mentioned above do not grow freely, except in the blood removed in quantity, and then only appear on the surface of the clot below the supernatant lymph after seventy-two hours culture at 37 degrees C. The growth then appears as a light scum, covering the clot and invading it from above.

In the blood stream it always appears as a streptococcic or streptobacillus; never, of course, as a chain. In healthy subjects an equilibrium has been established evidently; few cocci or bacilli appear; but in some anæmias and in rheumatoid arthritis clumps can often be detected in the fresh blood.

This coccal or bacterial invader, an inhabitant of the blood stream, is probably derived from the mouth from carious teeth, and is practically always an anacrobe. And this is the blood infection which, in my opinion, is responsible for the loss of immunity in the skin, and allows the normal skin cocci and bacteria to become pathogenic and the cause of acne lesion.

In all or most sufferers from acne there is a distinct anæmia, due to hæmolysis, the result of the loss of equilibrium and the over-increase of the invading streptococcus or streptobacillus, and in the majority of adolescent females some dysmenorrhœa is complained of. This, I believe, is due to infection of the uterine mucosa and the production of a vaginal endometritis and ovaritis, or, anyhow, an ovarian congestion, especially on the left side, and thus a vicious circle is established, the uterus infected from the blood stream, the growth of organisms and over-growth of the uterine mucosa and glands, the pollution of the blood stream with the toxins produced, and the reinfection of the blood with fresh bacteria or cocci.

The main avenues of entrance of the organisms from the oral cavity are:—Direct invasion through the socket of the tooth, absorption into the tonsil or spread backwards under the mucous membrane to the fauces and tonsils; and absorption through the alimentary tract, especially, I believe, through the portal circulation.

Normally, in all probability the liver cells act as barriers to the spread of organismal infection from the portal veins and bile ducts; but over-work of the liver does, I believe, destroy its protective power to a great extent, and it may be in this way that dieting a patient aids in the rehabilitation of the blood by restoring the barrier and preventing fresh inroads of invading organisms.

What I think is a proof that what I am advancing is not theory, but fact, is the effect of arsenic on most skin affections; and I may assert with safety that injections of soamin have a much greater and more lasting effect in most instances.

In anæmias I have obtained rapid improvement of the blood, increase in hæmoglobin, reduction of number of leucocytes, &c., by soamin injected over some weeks, and in a case of acne and millia the only treatment that had the slightest effect on the skin trouble was the injection of soamin, which also seemed to me responsible for an improvement in the blood and in the development of the patient, who was a young female. In all cases where soamin had

been administered hypodermically not only did the blood improve, but the number of organisms in the field of the microscope notably diminished.

A German observer last year examined the blood post-mortem in a succession of cases by culture, and concluded that in 50 per cent. the bacillus, &c., causing the death could be obtained.

The editor of the British Medical Journal pertinently remarked that if cultivation for anacrobic as well as for aerobic organisms had been tried probably the percentage would have been much greater. It is now recognised also that the bacillus typhosus can be obtained from the blood in the second week before a positive agglutination test can be obtained.

The tubercle bacillus has been cultivated, or rather demonstrated, to be free in the blood stream in a percentage of infected persons, especially in the later stages of tuberculosis. In puerperal septicæmia the blood is laden with streptococci, and just before death the leucocytes can be seen choked with cocci. Many other organisms, such as gonococci, pneumococci, &c., are known to exist in the liquor sanguinis, so that my claim that in every human being, after the first years of life, the blood normally or abnormally contains a flora, if not a fauna, as in tropical countries, is quite feasible. The work of tropical observers is far ahead of that of those in temperate regions, much to our discredit, and until the blood in the recent state is made the subject of closer study the profession will not be free from the reproach that medicine is an inexact science.

In conclusion, let me say that treatment under old methods was correct in many respects, the state of the digestive organs, including the mouth; the generative organs especially in females; the general environment, and the encouragement of healthy development of gymnastic exercises were all excellent in their way. To produce a cutis sana super corpus sanum should be our ideal, and to produce that I contend more than the simple injection of some autogenous vaccines, however prepared, is necessary.

THE TREATMENT OF ACNE BY VACCINES.

By Sir MALCOLM MORRIS, K.C.V.O., and ERNEST DORE, M.D., M.R.C.P.

THERE has been much difference of opinion not only as to the morphological and cultural characters of the acne bacillus, but also concerning the exact part which it plays in the symptomatology of acne in contradistinction to that of the staphylococcus. While these points are still in doubt the employment of vaccines in the treatment of this disease must be to a large extent empirical, and it will be necessary, in the first place, to give a brief account of the work of various observers who have investigated the subject, both from an etiological and a therapeutic standpoint.

The acne bacillus was discovered by Unna in 1893, and a full description of it was given by his laboratory assistant, Hodara, in 1894¹. Unna described the bacilli as small plump rods, $1\frac{1}{4}$ to $1\frac{1}{2}$ m.m. in length, and $\frac{1}{3}$ to $\frac{1}{2}$ m.m. in breadth. They were arranged irregularly

or in threads of three or four. They stained easily with basic aniline dyes, and were completely decolourised by acids. Apparently Unna never grew the bacillus; but Engman, working in Unna's laboratory with Hodara, claims that he obtained poorly nourished plate-cultures, but no subcultures, at that time.

In 1897, Sabouraud² found a micro-bacillus in great abundance in the fatty cylinders expressed from the sebaceous glands, and believed it to be the cause of oily seborrhœa, acne, and alopecia areata. He cultivated his organism from sebaceous material on peptone glycerine agar, acidified with acetic acid. The first result was a growth of non-liquefying staphylococci, followed in three or four days by conical pinkish or brownish colonies characteristic of the micro-bacillus.

In May, 1899, Gilchrist found a special bacillus, which he called bacillus acnes, in smears from ninety-six pustules in fifty-five cases of acne. In culture, fifty-four of the ninety-six were sterile on agar, eleven gave a culture of the bacillus on glycerine agar, and thirty-one gave growths of staphylococcus epidermidis albus. Pure cultures were best obtained from acne nodules. The skin was sterilised, and the nodule incised, and the first portion of the contents of the nodule squeezed out and wiped off with alcohol. The remaining portion was expressed and transplanted en masse to slant glycerine agar tubes. The clump gradually increased in size, forming a soft, white, pultaceous, easily movable mass, which was smooth, moist, glossy, and had a regular edge. The organism grew in blood-serum, in glucose agar in stabs (but with no gas formation) in bouillon, and very slightly on potatoes. The bacillus was described as a short, thick organism in the smears, becoming longer, thicker, and branched in cultures. Irregular staining was observed in older cultures. The bacillus was fatal to mice and guinea-pigs, which died in about a week, and it was recovered in pure culture from various organs.

In a further series of cases, published in 1903, cultures were taken from 145 lesions from thirty-one cases. Of these fifty-two yielded pure cultures of the acne bacillus, twenty-eight were sterile, fifteen showed cultures of b. acnes and only a few colonies of staphylococcus epidermidis albus, twenty-nine gave cultures of b. acnes and numerous colonies of staphylococcus albus, twenty-one yielded only cultures of staphylococcus albus. The reason that so many cultures were sterile was attributed to the fact that some of the media were not properly made. Gilchrist was also able to demonstrate acne bacilli in sections of acne lesions, and succeeded in obtaining agglutination of the bacilli by the blood-serum of patients suffering from acne. Further inoculation experiments on animals were negative.

Gilchrist's³ work was followed, in 1907, by a paper on the bacteriology of the sebaceous glands by Halle and Civatte.⁴ These authors, working in Darier's laboratory, at the Broca Hospital, on the anærobic bacteria of the skin, found a gram-positive bacillus of irregular shape, and often resembling a coccus, in great abundance in seborrhœic filaments and comedones. This they identified with the organism described by Unna and Sabouraud. The bottle

bacillus also occurred, in relatively small proportion, and some rare gram-staining cocci. Cultures were made by crushing a fragment of a comedo or sebaceous plug on a glass slide, and making an emulsion in a few drops of bouillon, which was then conveyed to the medium by means of a pipette.

Very few colonies were obtained in ærobic cultures, while in the anærobic they grew abundantly. The colonies in the anærobic cultures consisted of a pure growth of an easily stained, fine bacillus, often of the length of, but thicker than, a tubercle bacillus. Both comedones and seborrhœic filaments gave identical results, and if bacilli from a culture were placed on a slide on which a filament had been spread it was impossible to distinguish between the organisms. The bacillus was found to be a strict anærobo. All attempts to transplant it to ærobic media of various kinds were absolutely negative.

In April, 1909, Fleming⁵ published his work on the "Etiology of Acne Vulgaris and its Treatment by Vaccine." He described his bacillus, as seen in smears of comedones and pustules, as a small gram-staining bacillus, varying in length from under $1\ \mu$ to $3\ \mu$ or $4\ \mu$, and about $\frac{1}{2}\ \mu$ wide. In the comedo the bacilli were in general shorter and stouter, and stained evenly; in the pustule longer forms were seen, with irregular staining. Smears from acne pustules practically always showed the presence of the specific bacillus. Often no other organism was present, but in many cases staphylococci were present in greater or less numbers. In 44 per cent. of the pus films examined acne bacilli alone were found; acne bacilli with staphylococci in 53 per cent.; in six cases no organisms were observed, although two of these gave pure cultures of the bacillus; in one case only bottle bacilli were present.

Out of 132 cultures from acne pustules, pure growth of the acne bacillus was obtained on thirteen occasions. Of the other cultures, thirty-five were sterile, forty grew both acne bacillus and staphylococcus, and forty-four grew only staphylococcus. The large number of sterile cultures was thought by Fleming to be due to the fact the bacillus only grew with the greatest difficulty in some of the media used.

In pure cultures of the bacillus no change was observed for about three days, except an increase in the transparency of the mass of pus. Then three or four small white spots appeared, which slowly increased in size to obtain a diameter of 1 mm. at the end of a fortnight. In culture the appearance of the bacillus was the same as in pus films.

In addition to the acne bacillus, the staphylococcus and the bottle bacillus were the chief organisms found. Staphylococcus aureus only occurred on two occasions, all the other staphylococcic cultures being of the white variety, very few of which liquefied gelatin. Fleming also tested the agglutinating power of the serum of patients affected with acne on the bacillus, and obtained positive results in some cases, although not with the same dilutions as Gilchrist. He also found the opsonic index raised considerably in twenty-six cases examined. Experimental inoculations of week-old broth cultures

into two guinea-pigs were negative; but he succeeded in producing a crop of pustules on the skin of the forearm of a person suffering from acne by rubbing in a week-old broth culture of an acne bacillus freshly isolated from him. Films from the pustules so obtained showed no other organisms than the acne bacillus.

Of the investigations carried on by Sudmersen and Thomson,⁶ who believed that they had demonstrated the existence of at least two distinct strains of the acne bacillus, by Hartwell and Streeter,⁷ by Molesworth,⁸ and by Lovejoy and Hastings,⁹ we must not stop to speak. But it should be stated that Lovejoy and Hastings discovered the acne bacillus not only in acne lesions, but also in the sebaceous secretion of apparently healthy skin, especially around the alæ nasi, the sebaceous plugs giving smears and cultures of the bacillus as readily as the lesions. They found that gelatin agar or broth media were the most suitable, and that the difficulty of cultivation was largely overcome by growing the organism anærobically. Material from pustules, or large comedones, planted in masses on slant tubes rendered anærobic, gave rise at the end of three days to a mixed growth of round, greyish, heaped-up colonies of acne bacillus and larger white colonies of staphylococcus.

From the descriptions of the acne bacillus given, it seems probable that, despite its somewhat elusive and protean characters, all the observers named were working with the same or with different strains of the same organism. The apparent discrepancy as to the ærobic nature of Sabouraud's bacillus is explained, as Molesworth says, by the fact that the micro-bacilli in the centre of the material used for inoculation in Sabouraud's cultures were so protected by the surrounding fatty material that the penetration of oxygen was insufficient to prevent growth. Gilchrist and Fleming, whose organism grew ærobically, planted their cultures *en masse*. The other observers, with the exception of Halle and Civatte, succeeded in obtaining ærobic cultures, although with difficulty. Sabouraud made his inoculations deeply into the culture medium, which again would tend to bring about anærobic conditions. In some work done by one of us in 1901 an attempt was made to verify Sabouraud's statement that alopecia areata was caused by the micro-bacillus; but, although the organism was found in scrapings from the scalp and in a small proportion of the atrophied hairs, all attempts to grow it ærobically from these or from the comedo failed, and this we believe was also the experience of other workers.

Opinions as to the cause of the suppuration of the comedo are divided into two schools. Unna, Gilchrist, and Fleming believe that both comedo and pustule are produced by the bacillus, while Sabouraud, Whitfield,¹⁰ and Molesworth consider that the bacillus causes the comedo only, and that the pustulation is due to staphylococci. It is difficult to reconcile this difference of opinion among skilled bacteriologists, and it is possible that in some cases the pustules are caused by the bacillus, while in others the staphylococcus is the cause of the suppuration, as in staphylococcic sycosis. In some cases circulatory or digestive disturbance may be a determining factor, as it undoubtedly is in the pustulation of rosacea. It appears to us that the evidence for the acne bacillus as a pus-producer is very

strong; that the close approximation of the pustule to a comedo might indicate a further stage in the same process rather than a secondary infection, as argued by Whitfield; and that in those cases in which the staphylococcus predominates, the effects of the bacillus are overshadowed by those of the more active staphylococcus.

Therapeutic Effect of Vaccines in Acne.

Fleming divides cases of acne, for therapeutic purposes, into three classes—(1) Those in which the comedo is the dominant feature, including some which have progressed to the indurated and pustular stages. In this class the acne bacillus is the primary cause, and the staphylococcus, if present, is a secondary factor. These cases may, therefore, he holds, be treated with a vaccine of acne bacillus alone. (2) A large number of the indurated and pustular varieties, where both staphylococcus and acne bacillus are active factors in the inflammatory process. A mixed vaccine of staphylococcus and acne bacillus is required in this class. (3) Cases where there is more acute inflammation, tending towards a furuncular form. Here the staphylococcus is the active factor, and vaccines of the organism should at first be given, not forgetting that at the basis of the condition there is an acne bacillus infection. Fleming advises that before vaccine treatment is begun a microscopical examination of smears of the pustules should be made, in order to determine the class to which the case belongs.

In one case a dose of 10,000,000 bacilli derived from a three weeks' culture on acid agar caused a marked negative phase, followed by a rise and a subsequent drop in the opsonic index. Smaller doses of 6,000,000 showed no negative phase. The clinical condition showed a very marked correlation with the index, fresh lesions appearing with a low index, and improving as the index rose. This close correlation rendered the continuance of the opsonic estimations unnecessary in guidance for treatment, the clinical condition being sufficient for this purpose. Both autogenous and stock vaccines of acne bacillus were given, combined with stock vaccines of staphylococcus.

Some of the cases failed to improve on stock acne vaccine, and improved when an autogenous vaccine was given. One case was treated with staphylococcus vaccine for months, and the pustulation only improved when acne bacillus vaccine was administered. Experience, however, showed that in the vast majority of cases great improvement was obtained by the inoculation of a stock vaccine, combined with staphylococcus, when that organism was present.

The dose varied from 4,000,000 to 10,000,000, given at an interval of one to two weeks.

The appearance of fresh lesions either during the period of low resistance following the positive phase, or soon after an inoculation had been given, indicating too large a dose, was taken as a guide to treatment. The dose was increased until it just failed to show any negative phase. A number of cases were greatly improved, and in a fair proportion the lesions totally disappeared. In several instances there were recrudescences, which, however, soon yielded to subsequent treatment.

Western¹¹ divides cases of acne into three groups, accordingly as—(1) The comedo; (2) induration; (3) abscess formation is the dominant feature. This division corresponds roughly with Fleming's bacteriological classification already referred to.

In the first group he instances a case in which films of the comedones showed numerous acne bacilli, with very few staphylococci. The acne bacillus was grown, and a dose of vaccine, varying from 6,000,000 to 10,000,000, given at intervals of about eight days. The only local treatment was systematic expression of the comedones. After five doses the skin was clear, and the comedones ceased to appear.

According to this observer, the duration of treatment varies greatly, according to the severity of the infection. If, however, an autogenous vaccine is used, a rapid improvement may be confidently expected, and most cases will be clear within a month or two.

In the second group (acne indurata), due to a mixed infection of acne bacillus and staphylococcus albus, treatment was directed against both micro-organisms. In the case of a boy with numerous comedones, pustules, and extensive abscesses with induration, staphylococcus vaccine produced improvement in the superficial pustulation, but the comedones and tracking abscesses continued to form. The pus from the abscesses had been examined by culture with negative results; the acne bacillus was present, however, in films of the pus. The acne bacillus was then grown on suitable media, and treatment by vaccine thus obtained produced striking results, the cutaneous abscesses drying up and comedones being found with difficulty. In another case of acne indurata of three years' duration, treatment with staphylococcus vaccine for six months was successful in relieving the superficial pustulation, but the deep indurated foci did not cease to appear until acne bacillus was administered.

In the third group of cases, in which there is marked superficial pustulation, due to infection with staphylococcus albus, and very few sebaceous plugs, the pustulation is first treated with staphylococcus vaccine, and when this is cleared up it is possible to determine how far the acne bacillus is the real basis of the condition.

In a case of acne pustulosa on the back and chest, no comedones could be found, and culture failed to grow anything except staphylococcus albus. After four injections of this organism had been given, the pustules had entirely cleared up, and it then became evident that there were a considerable number of small comedones and sebaceous plugs, which, on examination, showed numerous acne bacilli, and cleared up after an acne bacillus vaccine was given.

In Western's opinion, either stock or autogenous vaccine of both organisms may be given, and it is seldom necessary to make an autogenous staphylococcus vaccine for a case of acne infected with that micro-organism. Occasionally, however, cases appear to make no improvement until their own organism is used. This rule is not so definite in dealing with the acne bacillus, and although he believes that the highest percentage of successful cases will be obtained when autogenous acne bacillus is used, the latter will suffice in many cases.

Lassueur¹² reports on twenty cases of acne treated with a mixed vaccine of micro-bacilli and cocci. In nine cases of pustular acne, with comedones, the results were favourable, but the effect was much more pronounced on the papulation and pustulation than on the comedones. In eight cases the effect was almost nil. In three cases there was temporary aggravation of the pustules, brought about by too close approximation of the doses. In two cases of pure comedo very pronounced amelioration was produced, and the improvement was maintained for three months. The doses were from 5,000,000 to 10,000,000 of acne bacilli, and from 125,000,000 to 250,000,000 of staphylococci every five to ten days, according to the severity of the case.

Engman¹³ reports on 118 cases of acne vulgaris, forty of which were treated with staphylococcic suspensions, and seventy-eight with suspensions of acne bacillus. He regarded staphylococcus vaccine as of little value. Some of the cases improved to a certain point, but then remained at a standstill, and its use was abandoned until he began treatment with acne vaccines in 1909. He found them of service, however, in rendering the lesions sterile of cocci, thus enabling pure cultures of the acne bacillus to be more easily obtained.

The first results with acne bacillus vaccine were discouraging, and many of the cases became worse; but success followed an improvement in the technique, and Engman now regards it as one of the most brilliant therapeutic agents he has seen in dermatology. The only drawback is the deeper and more marked scarring caused by the complete and rapid involution of the lesions.

Of 150 cases observed by Gilchrist, forty were treated three and a half years ago by staphylococcus albus alone; of ninety-one private cases some were given X-rays, local applications, and laxatives, others vaccines only. Many cases have remained cured, some had relapses. As the patients improved smaller doses of vaccine were administered. Doses of 100,000,000 to 200,000,000 of bacilli given at first were found to be too large, and sometimes produced definite constitutional disturbance. The dose recommended is 5,000,000, increased each week up to 30,000,000. The appearance of fresh nodules three days after the injection is an indication of too large a dose. In many patients seven to ten injections were sufficient to rid them of their acne. The oily seborrhœa accompanying acne was benefited by vaccines, but not so much as by X-ray applications.

Small doses at from five to seven-day intervals, with methods employed to produce local hyperæmia, were sufficient to secure immunity in the majority of instances. If, after a few doses, new lesions appeared after the third day, a larger dose of 7,000,000 to 10,000,000 was given, but this was rarely necessary. Under this technique even the deep indurated lesions underwent comparatively rapid involution, and cases of acne which had resisted skilled treatment for many years yielded to this method. A great advantage of the treatment was that the thick, muddy, yellowish, oily appearance of the skin disappeared, and the oily seborrhœa of the scalp also improved. It was not found necessary in any of the cases to use staphylococcus vaccines, and Gilchrist regards the coccus as a secondary factor of no therapeutic importance.

As the result of the past three years' experience, this observer is of the opinion that vaccine-therapy is of undoubted value, and in many cases curative. *Staphylococcus albus* vaccine was found helpful in cases of the superficial pustular type, but in the nodular variety *acne bacillus* vaccine gave the best results.

Inasmuch as the vaccine treatment of acne has not yet passed out of the experimental stage, we have thought it desirable to state the conclusions arrived at by others. Speaking now for ourselves, we must avow our inability to agree with Engman in regarding *acne bacillus* vaccine as one of the most brilliant therapeutic agents in dermatology, comparable in its effect to that of antitoxin on the diphtheritic membrane. As the result of an extensive use of vaccines in this disease we have been compelled to form a very qualified estimate of their value. Our experience certainly does not warrant us in advising their employment as a routine form of treatment of the affection. Rather we hold that they should be reserved for carefully selected cases. Such cases may be divided into three groups.

The first consists of cases characterised by severe, deep-seated pustules, forming boil-like lesions, occupying a large area—the face, and more or less of the chest and back; lesions in which micro-organisms are present in abundance, the *staphylococcus* greatly predominating, and the *acne bacillus* being difficult to find.

The second group is formed of cases in which the lesions are indolent and superficial, consisting chiefly of inflamed comedones which do not, for the most part, go beyond the papular stage, pustulation being slight, and, so to speak, accidental.

The third group is made up of cases which overlap the first and second groups, cases which combine the more severe and less severe lesions characteristic of those groups.

For cases of the first group a *staphylococcus* vaccine may be used with advantage. But it must be administered over a period of some months, and it must not be regarded as a substitute either for local treatment or for the ordinary forms of constitutional treatment. In cases of the second group we have found an *acne bacillus* vaccine to give good results; not, indeed, in all, but in a reasonably large proportion. In cases of the third group mixed vaccines of *staphylococcus* and *acne bacillus* are indicated. But in these two groups, as in the first, attention must be paid to the other factors concerned in the causation of the acne, such as the rapid development of certain glands with the advent of puberty, and the plugging of the ducts, reflex circulatory disturbance due to the strain thrown upon the nervous system by the changes of adolescence, disorder of the digestive organs, and the formation of intestinal toxins. Chronic constipation and any other functional disorders must be corrected, and the diet and mode of living carefully regulated. Nor must local measures be neglected. If suppuration has not occurred the comedones should be squeezed out, and the part washed frequently and energetically; if the suppurative stage has been reached the pustules should be punctured or incised, bathed with hot water, and dressed antiseptically; the skin should be disinfected, and in all cases of acne of the body reinfection should be guarded against by frequent

changes of the garment worn next to the affected part. Other valuable measures are the X-rays and radium. To the former the severest cases, in our experience, will yield if the treatment is sufficiently prolonged; the latter is of value for indurated nodules.

With regard to the comparative advantages of autogenous and stock vaccines, we are disposed to agree with those who hold that the former are the more efficacious, though in cases belonging to the second of our groups it is better, perhaps, to use a stock vaccine from a trustworthy source, owing to the difficulty of cultivating the acne bacillus. We have got our best results, in cases of this group, with the stock vaccine in doses from 5,000,000 to 10,000,000, given every week for ten days. If the cultivation of the bacillus be attempted, it is well to inoculate not only the special media on which the bacillus will ordinarily grow, viz., acid agar, glucose agar (anærobically), and oleic acid agar, but also human blood agar and Löffler's blood serum. Some forms of this bacillus are peculiarly delicate, and resent change of nutriment, but in general the micro-organism will grow upon the three special media mentioned. It is well to remember that pus containing the bacillus should not be allowed to become dry, as this frequently kills the bacillus.

Some of the observers whose work we have mentioned appear to attach importance to the opsonic index in vaccine-therapy. That view we do not share, our opinion being that in this connection the opsonic index may be disregarded.

In conclusion, experience prevents us from claiming more for vaccine-therapy in acne than that it is a useful adjunct of the ordinary forms of treatment. Occasionally, indeed, the condition will clear up in a remarkable manner under the administration of vaccine; but there is a marked tendency to relapse, and it is usually necessary to continue the vaccine for longer periods, and to reinforce it with the other measures mentioned. As an auxiliary to such measures it has a place in the treatment of acne; but there is no evidence that it is capable of inducing true immunity. When the real nature of immunisation is better understood it may indeed be found that certain of the local measures that have been referred to, and especially radio-therapy and radium-therapy, bear in the process a part at least as important as treatment by vaccines.

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VACCINE AND SERUM THERAPY IN CUTANEOUS AND VENEREAL PRACTICE.

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It is now over twenty-five years ago since I visited Australia on my way round the world, and well do I remember Sydney and its wonderful harbour. The pleasure of being able to contribute in a small way to the proceedings of your meeting is all the greater on that account.

The subject of the discussion is a very large one, and has been dealt with more or less exhaustively on many occasions, especially by the Royal Society of Medicine of London. I do not propose, therefore, to go over the same ground already trodden by many feet, nor to trouble you with the details and particulars of the methods employed, and so forth, but rather to set down in as concise a way as possible the conclusions I have arrived at from a clinical and practical point of view.

In limine, I may say that in the quite early days of vaccine treatment I made up my mind that the opsonic index, however interesting, would have to go, as a routine procedure. This called forth some thunders from the orthodox opsonists to whom I mentioned the matter. But nowadays it is generally admitted that the opsonic index is not absolutely necessary. If one exercises care in observing cases from a clinical standpoint one cannot go far wrong.

Another point I was very keen about from the first was the question of dose. I considered very small doses should be employed of tuberculin, for instance, in lupus vulgaris. This point has now generally been established, and it is wise to commence with small doses and feel one's way. Not infrequently I have found that 100,000,000 of staphylococci, that is when 1,000 millions had been gradually reached, in a bad or severe acne vulgaris case did not answer as well as 500,000,000 or 750,000,000. One must be guided by results in individual cases as one goes along, and not be dominated by *a priori* general views. The importance of dealing with every case on its own merits is so obvious that I need not dwell upon it. Yet it is well to refer to the point in passing, for it is one very apt to be overlooked by the rule-of-thumb mind.

As regards treatment, I consider that local and general measures should be employed, in addition to and concurrently with the vaccine treatment. I have had good results by bearing this in mind in cases which had been treated by vaccines only by the laboratory therapist without much success. I may remark here that the trained dermatologist is more likely to be successful in dealing with skin cases than the pure scientist, however eminent, who knows nothing about cutaneous troubles. I hold the clinician has his place in therapeutics and in the handling of patients. Medicine is still an art, and probably always will be, for from the scientific aspect we are as yet but on the threshold. There is still room for a sound and rational empiricism, I mean that founded on experience and observation. Hypotheses in science serve a useful purpose, but they have to be modified or thrown overboard altogether to make way for others. This is merely by the way.

I will now take cutaneous morbid conditions in which vaccine therapy plays a part.

Acne Vulgaris.—In bad cases there is no doubt of the value of vaccine treatment, either with stock or autogenous vaccines. The latter are theoretically preferable, but in practice they do not always give one the good results that one expects. In some cases stock vaccines answer as well, and sometimes better—*i.e.*, when autogenous vaccines have been disappointing. In cases where the lesions are mainly pustular, with very little in the way of comedones, staphylococcus aureus answers frequently very well. It is best to begin with 250,000,000, and increase by degrees to 1,000,000,000, at intervals of a week or so. But if 1,000,000,000 do not seem to answer as well as, say, 500,000,000, the smaller dose should be returned to rather than persevere with the larger. In these cases an alternation of aureus and mixed, keeping up the latter when improvement has been achieved, is useful.

In widespread cases, those involving the back and chest, in which numerous comedones are usually found, the acne bacillus vaccine, commencing with 3,000,000, and rarely going higher than 5,000,000, at intervals, I have found distinctly valuable. Here, again, such cases usually present pus lesions and boggy swellings, and the alternating or simultaneous employment of staphylococcus aureus and mixed staphylococcus vaccines are of considerable assistance. Local treatment, such as opening the boggy swellings with a fine knife to get rid of the broken-down centres; removing comedones by pressure instruments after the preliminary use of a soft soap and spirit liniment; massage by pinching up the sebaceous skin on the lines marked out by Jacquet; and friction with sea water, artificial or otherwise, is recommended by me to patients, and with good results. Blackheads can be readily squeezed out with the comedo-expresser I have devised. This instrument is well fenestrated with a blunt and rounded rim, and allows of leverage. I do not pretend there is anything wonderful about it; but it answers better than the instruments with very small openings for blackheads, or the lilliputian finnickling expressers which, in addition to very small openings, allow of next to no leverage.

As to the artificial sea-water, a packet of Brill's or Tidman's sea-salt to a toilet basin of warm water answers very well, and allows of treatment by dipping the centre of a bath towel in the solution and giving good friction to the back when a patient is single-handed and has no one to attend to him. Thoroughly rubbing the back after a dip in Coogee Bay would answer better still. This warm friction, and also the expressing of comedones, is best done two or three days after the acne bacillus vaccine has been injected.

Vaccine treatment, to lead to any good result, needs to be persevered with. In many instances a few injections are given in a half-hearted way and then stopped, with the poor result one would expect.

Personally, I have not seen aggravation of the acne trouble follow the use of vaccines in my practice. But I have heard of such aggravation, and in one case saw a patient in whom aggravation was said to have occurred, though there were not many traces of

such an effect when the case came under my observation. But it is well to know the possibility of such an occurrence, which is, in my opinion, no doubt due to employing too large doses at too frequent intervals. The instructions on the phials should not be too implicitly followed as the doses indicated are frequently too large.

In making these remarks I find it difficult to be more explicit, for it is very difficult to put in words one's reaction to a case when brought face to face with it. This personal reaction, or equation, if you will, is an organised reflex which is developed by practice, and cannot well be communicated to another ego. But failing this, what I have said may still be of use to others; or their experience may differ from mine in some ways owing to the factors at work in any particular case.

Acne Rosacea.—This is a different affair altogether to acne vulgaris. In this class of case vaccines (aureus and mixed) may be of use only when there is pustulation. As a rule, acne rosacea gives way to local general measures, the latter being mainly directed to the alimentary tract.

Furunculosis.—It is in recurrent furuncles that vaccine treatment at times gives very excellent results. But here again caution is necessary.

From an early period of the treatment of this condition by vaccines I have observed that a boil might act, as it were, as an auto-vaccine, and leave a patient free from recurrences for a longer or shorter time. On the other and, I observed, too, that one furuncle did not prevent the occurrence of another, sometimes acute and large. This I also found may follow the injection of aureus vaccine, and that very acutely in one or two instances. It is important, therefore, that soon after the subsidence of a furuncle, too large a dose of vaccine should not be injected. Indeed, very small doses are indicated.

This is a good opportunity of alluding, in passing, to anaphylaxis, to which phenomenon experimental medicine is addressing itself with a view to elucidating its intimate mechanism and the factors at work.

In furunculosis, an autogenous vaccine may not appear to act as well as a stock vaccine. Indeed, when a mixed instead of an aureus vaccine is used, improvement may follow instead of hanging fire when the autogenous was being injected.

An early furuncle, I may add, can frequently be aborted by injecting round it a few drops of 1 in 30 carbolic acid. In any case it will often hasten the separation of the slough. This treatment, when one is in the presence of a large acutely-forming boil, is better than a vaccine injection. Later, vaccine injections find their proper place, commencing with small doses. There is also the Bier treatment of boils, which also answers, and is well known to you.

Furunculosis may also require surgical interference at times, notwithstanding previous vaccine treatment. In one very bad case, in

which I had to relieve the patient in this way, he had been under the treatment of the high priest himself, and refused to have anything more to do with vaccines, which I suggested he should have.

I need hardly insist here that the urine of furunculosis patients should be examined.

Lupus Vulgaris.—My experience of tuberculin vaccine therapy in this disease has been disappointing. From the first I found this method of treatment, alone, gave very little result. In old chronic cases the impression made was practically nil, and as it necessitated many attendances at the hospital (for lupus vulgaris mainly affects the poorer classes) I gave it up for surgical measures, carefully followed up by X-rays, with much better and immediate results.

Tuberculin vaccine therapy may, however, be useful as an adjunct. But I found, as I have already stated, that it was most important to start with very small doses, gradually increasing, being guided by the patient's reaction. I know that some observers have claimed to have obtained very good results, but the few cases that I came across left me the decided impression that a delusional optimism was responsible for that opinion. In one case there was not an atom of improvement.

It is another story in cases of lupus vulgaris of the mucous membranes. In them there is no doubt tuberculin vaccine treatment is valuable, and gives good results.

As to lupus vulgaris treatment generally, it struck me long ago that insufficient attention was paid as to the hygiene, feeding, &c., of the patient.

I believe that lupus vulgaris is rare in Australia, so I will not further dwell on that condition.

Gummatous Tuberculides.—The story is very different as regards gummatous tuberculides. In one case the results of tuberculin vaccine treatment were very good. The patient was greatly benefited, but after some nine months' freedom fresh lesions appeared, necessitating further recourse to the vaccine treatment.

Impetigo Contagiosa.—This condition can be so readily cured by removing crusts and applying a diluted ammoniated mercury ointment that I have never treated it by means of vaccines. But a short time ago a case was brought to me which had been so treated, with little result, but which rapidly gave way when dealt with on the above lines. That is my only reason for alluding to impetigo contagiosa in this place.

Ecthyma. The case is different as regards this condition, and vaccine treatment may prove valuable. The possibility of a syphilitic basis must be borne in mind. In cases where there is no doubt about the syphilis, anti-syphilitic remedies must, of course, be employed. If any doubt, there is the Wassermann to assist in arriving at a diagnosis. The cases I am alluding to in which vaccines (staphylococcal) were useful occurred before the days of Salvarsan. The latter would be valuable in clearing up ecthymatous

syphilides, but where there were contra-indications to its use vaccines would have their place as an adjunct treatment to mercury and iodides. Further on I propose to deal with syphilis from the point of view of this discussion.

In localised bullous eruptions an appropriate vaccine is undoubtedly useful. Here an autogenous vaccine would be indicated. An obstinate case of the foot I have in mind was due to staphylococcus, and was greatly benefited by vaccine injections, employed concurrently with local disinfecting measures.

Pemphigus Vegetans.—At the London meeting of the British Medical Association last year I suggested that pemphigus vegetans should be treated on vaccine-therapy lines. This I had had in my mind for some time, for at Oxford, in 1904, I had read a paper on pemphigus vegetans and the bacillus pyocyaneus. I took the opportunity then of expressing the opinion that pemphigus vegetans was not an entity, but was a clinical morbid condition which arises as a result of infection by various micro-organisms. Last year I was called in consultation to a case, which I diagnosed as one of pemphigus vegetans, although, as often happens, it had been looked upon as syphilitic. I need not go into the details. They can be read at large in "Boeck's Festschrift" by those interested in the matter. A diplococcus was found in addition to staphylococcus, the latter being epiphenomenal. Vaccine-therapy failed, much to my disappointment. I had given a bad prognosis, for I have never seen a case of pemphigus vegetans recover. I was hopeful, however, that expert vaccine-therapy would perhaps save the patient. Our efforts were unsuccessful, but that is no reason for not employing vaccines in other cases, which may turn out more favourably.

Syphilis.—In this condition mixed infections occur now and then, ab initio—that is, the original infection may be due to treponema pallidum, plus a micro-coccus. In one recent case a streptococcus was isolated from a spreading phagedenic chancre, but vaccines did no good. In another case I observed, however, in which bone was attacked early in the disease, a streptococcus of a special variety was ultimately isolated. In that instance vaccines certainly appeared to be of great assistance. I say "appeared," for specific treatment was being employed concurrently.

Vaccines are useful in secondarily-infected ulcerated and crusted syphilitic lesions by staphylococcus, for instance.

Gonorrhœa.—There is no doubt that vaccines may be of great use in this condition, and should certainly be employed when the gonococcus has generalised and involved important structures. My experience here is limited, but in some cases I have found vaccine-therapy useful. In acute gonorrhœal orchitis, vaccines appeared to play a beneficial part as an adjunct to general treatment. Small doses should be employed, very small ones to begin with. This is an important point which must be insisted upon.

In cases of syphilis, plus gonorrhœa or gleet, I have been disappointed as to effects of vaccines on the latter. In one patient I

was treating concurrently with soluble injections of mercury the results were nil. The question arose in my mind if the non-success might not be due to that fact, and whether the mercury was perhaps interfering with the anti-gonococcal vaccine. Future investigations may clear this up.

Now as to serum-therapy. My remarks will be necessarily very concise on this point.

In a case of pemphigus vegetans, which was going down hill rapidly, the patient being practically moribund, rectal injections of polyvalent serum made him rally, and kept him going for some time. But the fatal event was merely put off.

In a case of acute lupus erythematosus, to which I have given the name of "d'emblee" (that is, primary acute lupus erythematosus) and which I have detached as a separate and special type from other forms of acute lupus erythematosus, the patient who was moribund rallied after rectal injections of polyvalent serum. But this improvement was only ephemeral. The details will be found at large in my Paris thesis. Why I allude to it here is to call attention to the use of polyvalent serum in desperate cases of generalised cutaneous conditions, which are almost bound to be fatal. The use of the polyvalent serum in this way was purely empirical, but perhaps future workers may be able to give us an explanation of the phenomenon, and possibly make use of the serum to better purpose.

In hæmorrhagic rashes, severe purpura, for instance, which we know may be the result of streptococcus infection, polyvalent serum injected into the rectum has certainly saved life.

In this connection reference must be made again to anaphylaxis. The investigation of this new group of phenomena may open up hitherto unexplored bush, which may reveal to the scientific prospector fresh means of combating disease.

Looking back now on a case that occurred some years ago the almost fatal termination of an erysipelas was no doubt due to the streptococcal serum repeatedly employed.

The severe urticarial and severe erythemas following the use of antitoxin will come to your minds in this connection. Nor will the employment of calcium lactate escape you either, though unreliable.

The injection of morphia appeared to save a patient in a serum anaphylactic condition. The case was recorded by a lady, whose name I have unfortunately forgotten, nor can I put my hands on the reference (British Medical Journal of 1910, I believe). Her action saved the man's life. I mention this here, for it is germane to the subject, and may prove valuable in emergency. Opium, again, showing in the shape of morphia its supreme value as a drug when properly used. No wonder De Quincy was enthusiastic about opium, though it led him a pretty dance.

In a bad case of gonorrhœa, complicated by the formation of a severe acute infra-urethral abscess, the rectal injection of polyvalent serum appeared to be useful in getting the patient right.

I am quite aware that the foregoing remarks are fragmentary. Notwithstanding, I hope listening to them may not strain your patience to breaking point. I have made no pretence of exhausting the subject in an encyclopædic way. I started with the proposition that I should give you details as to my experiences in this department of therapeutics, and that I have done as well as a heat-wave—which must have broken loose from the never-never land or outer outback—will allow.

Through the haze of hot days, and the fierce,
White heat-waves that flow on the sand;
Through the never-land, westward and nor'ward.

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SOME LABORATORY AND CLINICAL NOTES ON ACNE VULGARIS.

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ACNE vulgaris, although ranking as one of the more insignificant or minor ailments of general practice, is nevertheless a subject of sufficient importance to demand more complete laboratory and clinical investigations than have been devoted to it in the past. One has only to consider the prevalence of the complaint, how much discomfort it may occasion, its resistance to ordinary routine methods of treatment, and, moreover, the amount of uncertainty still existing as to the actual causative and accessory factors, to feel assured that it is a subject well worthy of further inquiry.

It was with a view of ascertaining whether the cases commonly met with in Australia were invariably associated with the presence of one or other of the micro-organisms usually referred to as the acne bacillus, and whether more pronounced and uniform success in treatment might not result from systematic administration of auto-genous vaccines, that I was induced to undertake a clinical and bacteriological study of this disease.

At the outset of this investigation many difficulties confronted me, for I found that bacteriologists, although agreeing in their descriptions of the actual acne bacillus as present in comedones and pustules, yet in their methods of isolating and cultivating the organism, and in their detailed descriptions of these, were widely divergent.

The acne bacillus was first described and named by Unna¹, who found it to be constantly present with staphylococci in smears from the comedones and pustules of acne. Sabouroud² made further investigations, and succeeded in obtaining a growth of the bacillus on an acid glycerine medium, employing a stab culture, and in four days obtaining, besides staphylococci, what he described as a reddish button, the size of a currant. From this he obtained subcultures of the bacillus in a month's time, the cocci having by that time died. Later investigators have differed widely in their methods of cultivation, and no two seem to agree. Flemming³, for instance, used a medium composed of oleic acid, glycerine, and agar, solidified and sloped, but emphasised the fact that the material must be thickly dabbed on, and not spread out thinly in the usual way. Again, Molesworth⁴ insists that the cultures should be made anærobically. Briefly, his method is to emulsify the comedo in saline and inoculate it into melted glucose agar.

In my own experiments I first used ordinary agar, acid agar, acid glycerine agar, and Flemming's medium in sloped cultures, ordinary broth, and glucose broth. The comedones were well rubbed over the slope, and were found to be extremely difficult to break up, and in some cases the comedones and remains of the comedones were left on the surface of the media. A copious growth of staphylococcus albus was always obtained, and on Flemming's medium and on acid glycerine agar, when the comedones were left on the slope they were found to become swollen, and round them a delicate haze had formed, which proved to consist mainly of bacilli resembling those seen in smears of comedones. But cocci were invariably intermingled with the bacilli; occasionally the bacilli were obtained from the glucose broth, but not from ordinary broth. In subcultures, however, cocci only invariably grew.

Having obviously succeeded in growing the bacillus, I next endeavoured to get a more luxurious growth, with the hope of obtaining a pure culture. Various and many were the methods tried. The media were altered in various ways—by increasing the acidity and by the addition of such substances as ascitic fluid, vaseline, lanoline, blood and milk—but with the same result, and in subcultures cocci only grew. Separation by heat was then tried, using emulsions of the comedones and emulsions of the cocci and bacilli obtained in culture, but no temperature was found at which the bacilli survived the cocci. Sabouraud, in his work, left his cultures for a month, and then found the cocci to be dead. This method was tried, the cultures being kept both at room and body temperatures, but at the end of even two months the cocci were alive. Anærobic

methods were then given a fair trial, and thereby most of the difficulties were overcome. Molesworth's method of emulsifying the comedones, employing melted media, I found to be tedious, especially where vaccines were to be used, and unnecessary, as the organisms grow well on a sloped surface when cultivated anaerobically. I now use this method, following Flemming's suggestion of heaping on the material and not spreading it out, and employ his medium, with the addition of a drop or two of ascitic fluid after the tube is sloped.

Descriptions of the Bacillus and Cultures.

The acne bacillus is easily demonstrated in smears made from comedones and from pustules from a case of acne vulgaris. It is in appearance a small diphtheroid organism, and is gram-positive, but not strongly so. In size and thickness it varies slightly in different cases. The organisms I have obtained in cultures resemble those seen in smears, but in repeated subcultures become less gram-positive, and in old cultures frequently show beading. The colonies are at first greyish-white, but after growing for some weeks they assume a creamy-pinkish colour which I deem characteristic. No growth takes place at room temperature, and at 37 degrees C. the bacillus takes from three to four days to make its appearance. I have in no case succeeded in obtaining a growth on ordinary agar or serum, even after repeated subculture.

Associated Organisms.

In an examination of thirty-five cases of acne—and from some of these cases repeated examinations were made—I have only once not obtained a growth of staphylococci. In every case the cocci have proved to be the white variety, but differ somewhat from typical staph. pyogenes albus. The cultures of this coccus are extremely viscid and tenacious, and this causes difficulty in making an emulsion for a vaccine, as the culture becomes twisted round the needle and pulls out in long threads. The coccus differs also from the albus in the coagulation of milk and in the liquefaction of gelatine.

Inoculation Experiments.

Injections into guinea-pigs of these cocci produced pus in varying degrees. Injections of the bacillus into guinea-pigs were without effect. Experiments were also made of rubbing the bacillus, mixed with lanoline, into the uninjured skin and ears of guinea-pigs, but without effect. A culture was similarly rubbed into the face of a monkey with negative results. The skin of a guinea-pig was shaved, and a culture of bacilli was rubbed in with lanoline and a seborrheic condition resulted four days later. Some of the scales were forthwith transferred to culture-media, and a mixed growth of organisms was obtained, amongst which were diphtheroids. Efforts to obtain the latter in pure culture were, however, unsuccessful. In this last experiment the shaving slightly damaged the skin of the animal. However, subsequent experiments have, without exception, proved negative, whether the skin were injured or not.

Influence of Autogenous Vaccines.

Coming now to the treatment of acne by means of vaccines, we may summarise as follows:—

The cases treated have been twenty-five in number, the majority of them being chronic cases, upon whom the ordinary methods of treatment had been tried, in some cases for two or three years. It has been said that the staph. albus is alone responsible for the pustular lesions, and accordingly nine severe pustular cases were treated for periods extending from three months to two years with autogenous staphylococcal vaccines. In some cases an improvement took place, but this was followed by a relapse, and no marked permanent improvement was established.

With regard to the vaccines made from cultures of the bacillus, twenty-one cases were treated with autogenous vaccines, and four with a stock vaccine made by a mixture of bacilli obtained from other cases. In only one case have I used a vaccine of the bacillus alone, and the result was not very encouraging. My reason for employing mixed vaccines is that as cocci are present with the bacilli both in smears and cultures it seemed reasonable to regard the condition as being a mixed infection.

Doses and Interval.

With regard to dosage it seems to have been the practice of previous investigators to use doses ranging from about 5,000,000 bacilli to 20,000,000, a scale with which I am in accord, although in acne as in all vaccine therapy personal idiosyncrasy plays an important part. Thus, in one case a dose of 10,000,000 resulted in a fresh crop three or four days after the injection, while in another 40,000,000 gave no bad result. The best results are, I think, obtained by commencing with a dose not larger than 5,000,000, and preferably less, and increasing according to the patient's condition. In no case did I take the opsonic index, but was guided as to increase or decrease of dose by the condition of the lesions and the occurrence or not of fresh crops. As my cases were mostly chronic, as a rule I found it best to give doses at weekly intervals. In six cases, however, bi-weekly doses were given, but the results were not so good, and I reverted to weekly doses.

Indications of Reaction to Vaccine Treatment.

One of the first signs of improvement to be looked for is the disappearance of the greasiness so commonly noticed. As a rule the patient is very quick to notice this change without any suggestion on the part of the medical attendant. Following this, the pustules, although perhaps as numerous as before, are more transitory, coming and going quickly, and they do not leave the same amount of disfigurement as hitherto.

Results of Treatment.

Of the twenty-five cases treated eight were cured, twelve show marked improvement, three show slight improvement, and two show no change.

Conclusions.

1. In a series of thirty-five cases of acne vulgaris I obtained cultures of a bacillus in every case by anærobic methods. The bacillus presented characteristic and uniform features in culture, and only grew anærobically. The cultivated organism closely resembled those seen in smears from the comedones. It had the appearance of a short diphtheroid bacillus. In all but one case it was associated with a coccus of the type of staph. pyogenes albus.

2. Of twenty-one cases treated with autogenous vaccines (bacilli and cocci) eight were cured and eleven were marked improved. The results obtained with stock acne vaccines were, on the whole, less satisfactory. The period of treatment ranged from seven weeks to five months, the interval varying from five to fourteen days, and the dose of the acne bacillus varied from 3,000,000 to 40,000,000.

3. The administration of autogenous coccal vaccines alone only produced transitory improvement in nine cases tried, in two of them treatment being continued systematically for periods of one and two years. The former is now showing marked improvement with the bacillary vaccine.

4. The majority of the twenty-five cases had undergone the usual methods of treatment without success, some for periods of two or three years. Under vaccine therapy, in most cases, all other applications were discontinued, but the patients were told to employ soap and hot water douching at night. Of the eight cases cured only one used other local applications.

5. These observations indicate a more than casual relationship between the acne bacillus described and the disease in question, and emphasises the superiority of vaccine therapy over other unaided routine methods of treatment.

In conclusion, I wish to acknowledge my indebtedness to Dr. Bull for his kind advice at all times, and to Dr. Hermann Lawrence and other medical practitioners for many of the cases examined during the course of this investigation.

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THE TREATMENT OF ACNE VULGARIS BY VACCINES OF ACNE BACILLUS.

By E. H. MOLESWORTH, M.B., C.M. (Syd).

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It is only during the last two years that treatment of acne by pure vaccines of the acne bacillus has been possible; in other words, although cultures were previously obtained (undoubtedly by Sabourand), it was only after the discovery of Hallé and Civatte that the organism was an anæroble that successful culture became generally possible. Several times organisms grown and used as acne vaccines have been shown to be cultures of strange bacilli.

The vaccines which I have used have almost invariably been prepared from cultures grown by myself, since my experience with bought vaccines has led me to suspect strongly that they were frequently not what they purported to be.

The method which I still use in obtaining a pure culture and in making a vaccine is that described in my previous paper on this subject. Briefly, successive shake cultures are made by inoculating melted glucose agar shake tubes with an emulsion made by smashing up comedo or pus in broth.

The third or fourth shake culture invariably shows distinct discrete colonies, which can easily be sucked up into a Pasteur pipette and reinoculated on a slope of similar (2 per cent.) agar, and incubated in a Buchner tube containing pyrogalllic acid and soda.

The organism is a slow grower; does not appear until the fourth or fifth day; but generally, at the end of ten days, sufficient growth is obtained for the purpose of making a vaccine.

This emulsion is sterilised at 60 degrees C. for one hour, graduated and put up in rubber-capped bottles or sealed glass tubes in strengths of 250,000,000 and 500,000,000 per c.c.

The Dosage of the Vaccine.

In the hands of my teacher, Dr. Whitfield, in London, and in my own, considerably larger doses than those usually recommended have usually been necessary in order to procure early improvement in the condition of those obstinate cases which generally come for treatment by vaccines. Whereas it is usually recommended to begin with 1,000,000 to 5,000,000, we have, during the past year, begun with 25,000,000 to 30,000,000. This was not arrived at except after continued trial, and it may be remarked that, as pioneers in the use of vaccines grown anærobically, we commenced operations with from 5,000,000 to 10,000,000; but, finding better results followed larger doses, have gradually increased the initial dose to its present size.

A marked negative phase has been the rare exception. Two cases only have exhibited a noticeable fresh outcrop, and that to doses of over 50,000,000 bacilli. Both cases were more or less acute in nature, and very widespread, involving face and neck and a large

portion of the back in a pustular eruption. One, on the fourth injection (100,000,000) showed an increase of pustulation, with tenderness of the existing lesions; the second, on second dose (50,000,000) showed a more marked degree of the same condition, and has had to be put on to extremely small doses since (1,000,000-3,000,000).

It must be admitted that not infrequently (two days after injection) there occurs an outcrop of three or four pustules (in about 20 per cent. of injections), but these lesions are very superficial and evanescent, and I now regard them with complacency, and find that the repetition of the same dose at the next injection is followed by a manifest improvement of the condition.

In my experience the outcrop of more than three or four pustules so often referred to in the literature as indicating an overdose, is most frequently due to insufficient rather than to over-treatment, and that improvement is obtained by increasing rather than by diminishing the dose.

As a valuable sign in differentiating a real negative phase from the natural progress of the disease insufficiently treated, I should like to draw attention to the fact that in a true negative phase the patient almost invariably volunteers the information that the lesions are painful and tender, and in any case a few questions will elicit the fact that they are so.

In 10-15 doses, the amount of 500,000,000 is usually reached without difficulty, and by this time the condition has almost invariably been reduced to the mere survival of a few comedones.

However, I particularly wish to avoid dogmatising upon the dosage of this vaccine, for the following reasons:—

- (1) Because the method of obtaining my emulsion involves about three weeks' culture, including one subculture, and I am quite prepared to admit that a quicker growth, such as might be obtained on an acid agar, might result in a more toxic vaccine which would produce a similar result with much smaller doses.
- (2) Because individual susceptibilities, depending chiefly upon the extent and the acuteness of the condition, will cause considerable variation in the effect produced by an identical dose in two different cases. These more acute cases can certainly be treated more advantageously by beginning with very small doses.

To one other point in particular I should like to draw attention, viz., that it has always appeared to me that the combination of staphylococcus vaccine with acne bacillus vaccine has been more useful in almost all cases, especially those of long standing, widespread disease, than a pure bacillary vaccine. This practice I still adopt, especially in chronic cases with wide involvement of the back in a pustular eruption, although some cases of acne indurata of the face, with deep suppuration, appear to be due to acne bacillus alone.

I should like to give details of three cases out of the fifteen in which I have been able to pursue a complete course of vaccine treatment.

Of these fifteen, seven may be said to be completely cured, hardly a comedo remaining. Five more were very markedly improved, although a few comedones persisted at the end of the course of injections. In two cases improvement, though noticeable, was not remarkable; but in one of these cases I still hope to get a good result finally. One case proved quite refractory.

Cases.

Miss O. (21).—Indurated acne of face, very marked on cheeks and chin, which has been present for four years. During the past two years the condition had become deep-seated, large, deep, infiltrations causing much disfigurement. They were also sore, especially on attempts at expression, which were rewarded by only a small amount of pus; numerous comedones to be seen.

This case had resisted all local means of treatment; the patient, who was a nurse, had been well treated, but the condition was obdurate.

Treatment was begun with 30,000,000 bacilli, and the amount slowly increased week by week, by 20,000,000, and afterwards 30,000,000.

After the third injection of 75,000,000 distinct improvement was noticeable, there being less induration, less pustulation, the existing lesions slowly settling down, and no new ones appearing.

After the sixth injection (120,000,000) the condition is noted on my card as remarkably improved, no induration, a couple of small abortive papules, and a few blackheads remaining.

In order to obtain complete disappearance of all blackheads, injections were continued, and gradually increased, until seventeen in all (the last one of 500,000,000) had been given, after which my notes show an entry: "Now no spots or comedones to be seen; apparently complete cure."

This was the most favourable case in the series. The patient being a nurse, I was able to continue longer than a private patient will usually prolong her visits, and the final result was perfect.

The original condition of the patient was most distressing to her, she being acutely conscious of the disfigurement, which was very noticeable, never going out without a thick gossamer; while, in addition, she complained that her appearance interfered considerably with her nursing career.

At the conclusion of the treatment no disfigurement beyond a few scars, which were only noticeable on close examination.

M.F. (20).—Mild acne of face, consisting of a few pustules without any deep induration.

On the back were a number of hard papules, a considerable number of which were pustular.

This patient had been subject to the condition for several years, and it had persisted in spite of local treatment.

She, too, was begun with 30,000,000, but the dose was more rapidly advanced than in No. 1.

After the fourth injection (120,000,000) no fresh pustules occurred, and the patient appeared well except for the presence of fairly numerous comedones.

At the tenth injection she was brought up to 500,000,000, and was then practically free of comedones. There was no sign of papule or pustule formation, and no scars visible.

Although at the time I thought a few more injections would have been advisable, I have heard lately from the patient, who describes herself as completely cured.

W.N., æt. 24 (M.), suffered from a rosaceous condition of cheeks, with marked acne pustules and comedones on forehead, and a condition on his back described in my notes as "an enormous amount of comedones, pustulation, and induration."

This had persisted for six years in spite of continuous treatment with sulph. resorcin, &c.

He commenced treatment with 20,000,000 bacilli, and, since much of the trouble on the back was evidently furuncular, and even grew staph. aureus, with 25,000,000 of that organism. It must not, however, be imagined that the majority of lesions were boils. Some seemed to have become secondarily infected, and were clinically and pathologically boils; but the vast majority were suppurating comedones.

After the third injection (staphs. 75,000,000, bacilli 75,000,000) his card shows the note: "Much improved, especially on back, less pustulation, less induration."

After eight injections (last 300,000,000 of each) the patient considered himself cured, and went off up country to the harvest, and I have not heard of him since, although he promised that if there was any fresh outcrop that he would return.

Four other cases still under treatment show similar improvement by similar methods, two receiving now over 300,000,000; two over 200,000,000 at the last injection.

An occasional abortive papule is still noted in two, but these are very superficial, and disappear in two days.

In addition, in all honesty I want to admit two cases, one of whom showed a very intense negative phase, with large outcrop of fresh pustules, which were painful and tender after the second injection of 50,000,000, and who is now to go back to small doses (5,000,000).

The second unfavourable, or rather partially unfavourable, case is one in which the condition was one of acne keloid, with marked suppuration extending upwards to the occipital protuberance, and downwards on to the shoulders; marked acne of face as well.

The condition has improved, and under the influence of X-rays the keloid condition has become much less marked; still, occasional accumulations of $\frac{1}{2}$ drachm of pus occur in neck. This in spite of the fact that he has received upwards of 500,000,000 in his fifteenth

injection. However, I have great hopes of being ultimately able to count this man among the cured, although he is taking longer than expected.

Other cases which have come to my hands have been unable to remain in Sydney for sufficient time to give ground for deductions as to the efficacy of the vaccine, and, although improved, are not to be classed as legitimate evidence.

This method of treatment I should like to recommend strongly to those engaged in dermatological work, who know the extreme obstinacy of some cases of acne. The cases described above, and several others in my fifteen, were such obstinate cases which had resisted all other methods. I should also recommend the use of vaccines grown and graduated either by yourselves or from your own cases, as my experience with bought vaccines has been most disappointing. The organism, being anærobic, is difficult to cultivate; but the trouble is really repaid by the results obtained. I have not found it necessary, however, to have an autogenous vaccine for each patient; a stock vaccine, made up and superseded every three months, giving, in my hands, quite as good results.

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DISCUSSION ON THE VACCINE TREATMENT OF ACNE.

Dr. IRELAND, in opening the discussion on the vaccine treatment of acne, said: I cannot claim to be a dermatologist of any standing. I have only worked at it in an amateurish sort of fashion, and have dabbled a little bit in radium and X-ray treatment, and have lately been trying my hand also in vaccine treatment of skin diseases. I have been asked to make a few introductory remarks on the treatment of acne. I think, on this occasion, one should not commence the reading of papers without some allusion to vaccines, and I believe this has been made a special feature of the discussions at this Congress, particularly in the domains of medicine and dermatology. Dr. Lawrence has told us what he thinks, and I am sure he is quite right in thinking so, that no treatment can compare in its effects with vaccine treatment of skin diseases. I think we may claim that in the vaccine treatment of many skin troubles we have a marvellous weapon at our hands, and I think we can do work that will be of great value even in general medical diseases. We have in "skin" diseases something one can see, feel, and touch,

whereas in ordinary medical disease the actual treatment is based more or less on the general improvement of the patient, or improvement in the blood which takes specialists to discover, and is a matter of hypothesis. Vaccine treatment, I think, will be to medicine what Listerism has been to surgery. It was thought at one time that surgery had got to its limits—that no further advances could be made; but then Lister introduced his method, and that was the beginning of the large advances which have been made in surgery; and I think that in medicine, too, large advances have been made by the introduction of vaccine therapy. There has been a gradual development of vaccine treatment, and in the meeting of the dermatological section we have a lot of questions to ask ourselves, as we know practically nothing about the vaccine treatment of acne, the elucidation of the origin of which lies more in the province of the pathologist and bacteriologist than in that of the clinician. I say myself I know nothing at all about it. I am wishing to learn how to treat cases of acne, and how to make the treatment a permanent one. I hope we will learn a lot from the papers here—something that will be a surer weapon in our hands than it has been in the past.

THE PRESIDENT (Dr. Lawrence) said: The subject of the treatment of acne by vaccine is now open for discussion.

Dr. DENNISS said: I have not very much to say on this subject, because I have not had a great deal of experience in the treatment of acne. My experience has been very limited with regard to vaccines. I remember in the early days of the vaccine treatment the cultures were taken from pustular cases of acne and vaccines prepared from them and injected. In some cases there was an improvement up to a certain point; in others there was no improvement. Later on, the acne bacillus was cultivated by Sabourand, and vaccines prepared and injected. Improvement seemed to take place just the same as in the case of the staphylococcus vaccine, but only reached a certain point. In several cases which he has had recently he has combined the two vaccines, the staphylococci and the acne bacillus vaccines, and got much better results than when only one or the other was used alone. The vaccine treatment of acne produces much more rapid improvement than any other method he knows of.

Dr. F. A. BENNETT said, that in the treatment of acne, I believe there is a future for vaccine therapy, and our success will depend on our ability to read and properly to interpret the various clinical phenomena which follow an injection. The negative phase, characterised by lowered bacterial resistance, is accompanied by aggravation of clinical symptoms; whilst the positive, characterised by increased bacterial resistance, is associated with improvement of these symptoms. Our aim in dosage, then, will be to obtain as short a negative phase as possible, followed by as long a positive as possible. Wright, by frequent determination of opsonic index, found an ideal dose to be, where negative phase did not exceed twenty-four to forty-eight hours, followed by a positive phase of eight

to ten days, and where at this interval the opsonic index was higher than at the outset. Frequent determination of opsonic index is impracticable in ordinary practice, but correlated with the various phases are certain clinical symptoms, and those we can substitute for opsonic index, and by them gauge our dosage and interval. Much of the discredit which has fallen upon vaccine therapy is due, I believe, to too high initial dosage, which will often aggravate the condition, and may convert a mild into a severe case. My best results have been obtained by following the method of Engman, who, from the experiments of Flemming, Gilchrist, and Western, believes the *acne bacillus* to be the real cause of *acne vulgaris*, and the *staphylococcus* to be merely a secondary invader. Discarding the *staphylococcic* vaccines, Engman has elaborated an *acne bacillus* technique, which he claims to be "the most brilliant therapeutic agent yet seen in dermatology." The initial dose never exceeds three millions. Usually, within the next forty-eight hours, two or three fresh lesions appear. If more than three, dose is too high. On the third day, when the immunizing blood is at its flow, all blackheads are expressed, pustules opened, cystic cavities emptied, and their walls rubbed together in order to determine further immunizing blood to the parts. For similar reason, hot towels are now applied to face for five minutes night and morning. About the seventh day, fresh lesions generally show up, heralding the stage of depression, and indicating need for further dosage. Three to five millions may then be given, and continued till cure is effected. Seldom is there any need of higher than seven to ten million dosage.

Dr. AYRES said: His experience in connection with vaccine therapy was gained in Professor Wright's laboratory in St. Mary's Hospital, London, where he worked for some months, and where he had the privilege of studying Wright's methods and the work he was doing in connection with the vaccine treatment of disease and especially the vaccine treatment of acne. I was working in the laboratory when Flemming was doing his work in connection with acne, and I believe, and have always believed, that what Flemming put forward was absolutely true, and that the chief organism concerned in acne was the *acne bacillus*, described first by Unna, and later cultivated by Sabourand and Gilchrist. Sabourand believed that the *acne bacillus* was the cause of the seborrhoea of the skin and of the comeda, but that the pustulation was caused by the *staphylococcus*. Later, Flemming also cultivated the *acne bacillus*, and came to the conclusion that it was the cause, not only of the comeda, but also of the pustulation. That was in 1907. Professor Wright, in his earlier cases, only injected *staphylococcus* vaccine, and got good results; but Flemming, with a vaccine prepared from a culture of the *acne bacillus*, got better results in treatment than had been obtained previously by the use of the *staphylococcus* vaccine. His personal opinion is that the real cause of acne, in all its stages, is the *acne bacillus*, and that in many cases the *staphylococcus* is a secondary invader. That the treatment of acne first of all should be by injection of *acne bacillus* vaccine, supplemented later on, if necessary, by the injection of *staphylococcus* vaccine. Although he was greatly in favour of the treatment of acne by

vaccine, he said that he had found that small doses of X-rays have a very beneficial effect on acne of the face, and that larger doses do good in acne indurata of the back.

Dr. STRAHAN said that, as a general practitioner, he had come across a number of cases of acne, which he had treated by means of ointments, &c., in a general way. Then six years ago he began to treat acne with X-rays. The other day he saw the first case which he treated with X-rays—a woman of about 28 years of age, with extensive acne on the face, so bad that she would not go into society, and always wore a veil. He treated her with X-rays, and so far she has had no return. Since then he had treated many other cases of acne with X-rays, and his results had been very good. He had always used the X-rays in the treatment of acne, and found it hard to determine how much good the vaccine treatment had done.

Dr. EDWARDS said he believed that the acne bacillus is the real cause of acne, and that the staphylococcus is a secondary invader. He said that it is claimed that there is a uniform success in all cases where the new method had been employed.

Dr. BLACK said that, in speaking on a dermatological subject at a meeting of this kind, he thought he was on rather thin ice. As a general practitioner, he had listened to this discussion with great interest. The feeling he always had is this: that acne is a disease which appears at a certain time of life, and he treated it with the idea of building up the individual. In the treatment of acne, he would like to ask if they gave all the credit to the vaccine alone?

Dr. LANGLOH JOHNSTON, spoke of his experience of the vaccine treatment of acne, especially in connection with the dosage, believing that small initial doses, at from one to three million, should be given, and these gradually increased if necessary, and said that he did not see how a vaccine could cure the comedo.

Dr. CROWLEY (Melbourne) finds that relapse occurs after the vaccines are given up in cases of acne, and that in extensive pustular acne he has got good results from X-rays treatment. He would like to ask Dr. Molesworth what his experience has been as regards permanence of cure?

Dr. McMURRAY has found in his experience that relapse after vaccine treatment of acne is frequent, and asks how can a vaccine cure the comedo unless it is first pressed out? From his own experience, and what he has read, a stock vaccine seems to answer as well as an autogenous vaccine, and that the initial doses should be from one to three millions. He believes that acne must be treated constitutionally as well as locally, and that toxins absorbed from the intestine has something to do with the production of acne. In the treatment of acne, he relies principally on local measures and X-rays. By these means he can, as a rule, cure the worst case in six or eight weeks, especially in acne on the back. He had one patient, a lady, who had told him she had received seventy acne vaccine injections without any benefit. This only shows you the perseverance a patient must have to keep on going to a doctor week after week for seventy injections.

Dr. LAWRENCE (Melbourne) said that the papers on the treatment of acne by vaccine were of great interest and importance. Acne is a disease of youth, chiefly occurring between the ages of 13 and 20. It begins on the face and back, and he considers that one of the primary aehological factors in the production of acne is a vasomotor instability in these regions as shown by friction of the skin with a smooth pen-handle. This vasomotor reaction can be controlled and modified by a few X-ray applications. The comedo caused a tremendous reaction in young people, and to control this and check the increased functional activity of the sebaceous and sudoriparous glands that occur, especially at puberty and up to 25, he employs mild doses of X-rays or radium.

Dr. MOLESWORTH, in reply to remarks made in connection with his paper, and in discussing the vaccine treatment of acne, said that the most contested point seemed to be on the question of dosage. He would like, however, to commence by explaining that remark of Dr. Bennett's, about the case which he had seen. That case was the one mentioned by him (Dr. Molesworth) as having shown a marked negative phase at the early part of the treatment, after an injection of thirty million. He would like to say, in defence, that they did not commence treatment with a dose of thirty millions until a long period of experimental dosing, beginning with five millions, and that it was by experiment that the initial dose of thirty millions had been arrived at. Let him repeat that a very probable explanation of the difference in dose is the manner of culture. Quite possibly the medium used by him does not grow organisms of so virulent a type as acid agar. Then, with regard to Flemming: It was on reading Flemming's paper, and hearing some talk, that first stimulated him to work on this subject. He came back from Paris after learning the anaerobic character of the acne bacillus, and said to Dr. Whitfield (Professor of Dermatology, King's College, London)—What is this about Flemming growing this organism aerobically? After working with cultures supplied by Flemming, they were able to prove that the organism cultivated by him was distinct from the acne bacillus to the satisfaction of the Science Research Club. It is now generally recognised that the organism that Flemming grew was not the acne bacillus. What he grows now is the acne bacillus, because when he learned the anaerobic nature of the organism, he set himself to rectify his error as soon as possible.

Dr. Crowley has asked a question as to the permanence of the cure. As far as can be seen, with regard to the results obtained in the treatment of these acne cases, he has generally found it necessary to give fifteen doses. In cases thoroughly treated in this way, as far as he can judge at present, the result, in what were very bad cases of acne, has been that they are apparently well. He sees them about every month, and so far there has been no recurrence of the condition, and it may be that the large doses, which so many oppose, may be responsible for the permanent result.

He had to thank Dr. McMurray and Dr. Johnston for drawing attention to the obvious fact that one cannot expect comedones to

be removed by vaccine, although their recurrence, after expression, may thereby be prevented. Personally, he does not find it necessary to use other than stock vaccine made from a virulent case of acne. With regard to the question as to what local treatment was used, he may say that nearly all his cases were of a very chronic nature, and that they had all had local treatment *ad nauseam* without any effect. A little sulphur and salicylic ointment (3 per cent. of each) was given to most of them as a placebo.

As regards X-ray treatment of acne, he is personally rather disinclined to apply X-rays to the face, because of some risk of causing an atrophic condition of the skin; but in cases involving the back, most encouraging results have followed the use of X-rays.

AN ANALYSIS OF 5,000 CONSECUTIVE CASES OF SKIN DISEASE OCCURRING IN DR. HERMAN LAWRENCE'S CLINIC.

By ROLAND R. WETTENHALL, M.B., B.S.

DURING the past three years I have been assisting Dr. Lawrence in his hospital and private practice, and the following cases have occurred during that period. I must here acknowledge my indebtedness to him for permission to publish this account.

The cases are made up of equal numbers of hospital and private patients, i.e., 2,500 of each. This considerably facilitates comparison.

Added interest is given to the analysis as it indicates the change in skin practice since the inception of X-rays and radium as therapeutic agents, Dr. Lawrence having used both extensively for many years.

We see the result in the proportion of rodent ulcers, epitheliomas, keratosis, nævi, &c., being greater than in former analyses, and this partly accounts for a diminution in the percentage of eczema, for instance, which in past years formed such a large part of the dermatologist's practice.

One should also mention that the hospital cases are collected from out-patients and at general hospitals (the Melbourne and St. Vincent's), so that cases of gangrene and purpura, for example, though seen as in-patients, are not here recorded, and, as few children attend, affections such as tinea tonsurans and lichen urticatus will be of small percentage.

The difference in the proportion of some diseases occurring in England and Australia has been pointed out previously by Dr. W. McMurray and Mr. A. W. F. Noyes, and the following figures agree closely with

theirs in the case of lupus vulgaris, i.e., 4 per 1,000 in Victoria, instead of 10 per 1,000 in England. It is also remarked that many of these patients have been born in the United Kingdom, and that the disease here is of a very much milder type than that occurring in the old country.

With regard to lupus erythematosus, Melbourne figures are much below Sydney, as represented by Dr. W. McMurray's clinic, and his again are less than half those occurring in England.

Lupus erythematosus accounts for 1.1 per cent. in this analysis, .7 per cent. in Dr. Noyes', 1.9 per cent. in Dr. W. McMurray's, and 2.54 per cent. in England.

Rodent ulcer, epithelioma, and keratosis, which frequently precede malignancy, are very common and form large percentages.

Rodent	...	...	...	...	3.8 per cent.
Epithelioma	...	...	...	...	1.8 „
Keratosis	...	...	...	2	„

These three conditions total 7.6 per cent. of cases, which is, of course, greatly in excess of previous analyses, and indicates to some extent the influence of radio-therapeutics on skin practice.

Crocker's 14 rodent ulcers in 10,000 hospital cases compare with 84 in 2,500 hospital cases here; and 34 in 5,000 private cases with 108 in 2,500 private cases of Dr. Lawrence's.

Dr. Lawrence's figures make rodent ulcer more than twice as common as Dr. W. McMurray's, and of course the former's especial attention to the use of radium during the past eight years has undoubtedly affected these figures. Notwithstanding this, malignant disease of the skin is evidently very prevalent in Australia, and the action of the sun's rays has doubtless a good deal to do with it. Another factor which perhaps comes in is this—we may have a greater proportion of old people in Australia owing to the mildness of climate, and, as a result, a disease of the old takes its larger proportion.

Of course there are other cases which occur in Australia and not in England, though they are not of very special form. Amongst such I would mention dermatitis amongst cabinetmakers using blackwood, i.e., *Acacia melanoxylon*, of which there has been a number of cases; also the extremely irritable dermatitis occurring in the scrub-cutters of Eastern Victoria, i.e., Gippsland, called the "dogwood itch," which frequently sets up an intractable attack of eczema.

Also cases of the barcoo rot, a vesico-bullous eruption, becoming pustular and producing slight surrounding inflammation, occur frequently in men who have a diet of any quantity of meat and few vegetables, such as is obtained on "way-back" stations.

Dermanysius, the parasite discovered by Dr. Lawrence, also accounts for some cases, of an extremely pruritic nature.

In classifying cases I have followed out Sequeira's method, based mainly on the etiological factors and as used in his lately published book.

I will now consider the various divisions.

I. INDEFINITE—
These cases were not classifiable owing to previous treatment or some such reason.

II. CONGENITAL AFFECTIONS—
Here the large number of naevi is noticeable, totalling some 3 per cent. of the whole number of cases, and private cases are considerably in excess of hospital.

III. ERUPTIONS DUE TO LOCAL IRRITATION—

Under this heading comes traumatic dermatitis, and here, when traceable to local irritation, lesions of an eczematous appearance were classified.

Two cases of paraffinoma are remarkable in this division.

Six cases of X-ray dermatitis, the majority of which were chronic in type, are recorded, and the majority of them were the result of treatment by an unqualified person.

Although inflammation, the result of radium applications was seen, it is not included in the analysis, as it was not a cause for anyone seeking treatment.

The tables show the number of cases of each disease occurring in 2,500 hospital cases in the first column, in 2,500 private cases in the second, and the total number in the third column.

The total number of cases in each division of the classification is also shown.

	Hospital.	Private.	Total.
I. INDEFINITE—			
Indefinite	14	4	18
II. CONGENITAL—			
Ichthyosis and Xeroderma ...	8	9	16
Tylosis and Keratosis palmaris	1	3	4
Epidermolysis bullosa ...	1	...	1
Nævus pigmentosus ...	6	46	52
" verrucosus ...	...	3	3
" vasculosi angioma ...	23	47	70
Lymphangioma circumscripta	...	1	1
Adenoma sebaceum ...	2	1	3
Multiple fibromata ...	3	1	4
Xanthoma ...	...	1	1
III. ERUPTIONS DUE TO LOCAL IRRITATION—			155
Bunion	1	1	2
Mechanical trauma, &c. ...	54	31	85
Intertrigo	2	1	3
Callositas	1	2	3
Clavus	3	9	12
Dermatitis artefacta ...	3	5	8
Paraffinoma ... ..	...	2	2
Dermatitis due to heat ...	2	2	4
Solar erythema	7	3	10
Ephelis ... ..	...	2	2
X-rays... ..	...	6	6
Radium ... ..	...	...	...
Dermatitis occupatio	10	...	10
" plants ...	3	2	5
" local drugs	3	1	4
Cheilitis ... ..	...	7	7
			163

IV. ECZEMA—
The percentage of eczema is small (12 per cent.) partly owing to increased proportion of lesions where treatment by X-rays and radium has advanced, but also owing to increased knowledge of the etiology of skin diseases and particular care in tracing such. Numbers in private and hospital clinic closely correspond; the percentage in Crocker's analysis was 26.

V. AFFECTIONS DUE TO ANIMAL PARASITES—
Here we find that scabies has increased from being a rare condition a few years ago to provide 7 per cent. of hospital cases and 1 per cent. of private cases. The increase has been especially noticeable since the return of Australian contingents from the South African War.
A notable absentee in this division is the Pediculus pubis, of which there is one case in hospital records; three cases in private were recently arrived travellers.

VI. AFFECTIONS DUE TO VEGETABLE PARASITES—
Tinea tonsurans would seem to be much less common than in London. Crocker's 13 per cent. compares with 1.3 per cent. in this analysis. Hospital and private figures closely correspond, so the fact of children not coming to the general hospitals does not seem to account for the small proportion altogether. In Tinea barbæ about 50 per cent. of cases have had kerion, and the great majority were traceable to infection from horses.
Erythrasma, Dhobie's itch, accounted for four cases in a thousand of private practice, and occurred as a rule in people who had been abroad.

	Hospital.	Private.	Total.
IV. ECZEMA—			
Eczema ...	278	312	590
Eczematization ...	26	13	39
Dermatitis ...	42	19	61
„ vesico-bullous ...	22	...	22
			712
V. AFFECTIONS DUE TO ANIMAL PARASITES—			
SITES—			
Scabies ...	176	22	218
Ped. corporis ...	50	1	51
„ capitis ...	19	1	20
„ pubis ...	1	3	4
Pulex irritans ...	4	...	4
Culex ...	2	1	3
Dermanyssus ...	...	1	1
Demodex ...	..	2	2
Unclassified ...	3	2	5
			308
VI. AFFECTIONS DUE TO VEGETABLE PARASITES—			
Favus ...	1	...	1
Tinea circinata ...	15	24	39
„ tonsurans ...	30	37	67
„ barbæ ...	24	10	34
„ versicolor ...	13	3	16
Erythrasma ...	3	10	13
			170

VII. MICROBIC AFFECTIONS—

Microbic affections, as one might expect in the case of skin troubles, form a large percentage of cases—*i.e.*, over 20 per cent.

Impetigo contributes about 3 per cent.

Infected dermatitis " 2 "

Sycosis cocogenic " 1 "

Cases of seborrheic origin about 6 per cent.

Acne vulgaris, comedones " 6 "

Lupus vulgaris has been considered previously.

The one case of leprosy occurred in a native of the Philippines, who was visiting Melbourne with a troupe of acrobats.

	Hospital.	Private.	Total.
VII. MICROBIC AFFECTIONS—			
Lymphangitis... ..	2	3	5
Erysipelas	8	5	13
Impetigo contagiosa, bullosa, and Ecthyma.	108	36	144
Impetigo herpetiformis ... ..	...	1	1
" follicular	28	15	43
Furunculosis	10	14	24
Infected dermatitis	89	15	104
Pityriasis alba	15	6	21
Carbuncle	1	...	1
Cutaneous and subcutaneous abscess	3	6	9
Sycosis cocogenic	26	20	46
Derm. papillaris capillitii ... ..	...	1	1
Granuloma pyogenicum	2	...	2
Anthrax	1	1	2
Vernix caseosa	1	...	1
Seborrhea	129	181	310
Acne vulgaris, comedones	124	180	304
Acne varioliformis ... ..	...	1	1
Tuberculosis verrucosa	2	2	4
Scrofulodermia	2	3	5
Lupus vulgaris	5	15	20
Papular tuberculide ... ..	...	2	2
Leprosy ... ..	...	1	1
Chancroids ... ..	...	2	2
			1,056

VIII. SYPHILIS—
Syphilis, 6 per cent. of hospital cases, is considerably below Dr. Noyes' figures, which give 17.5 per cent.; but the difference is seen to be almost wholly in the secondary cases, and a change in hospital administration may account for this. Taking tertiary cases in hospital practice, Dr. Noyes' analysis gives 5.3 per cent. and these figures about 4 per cent. Syphilis accounts for only 2.6 per cent. of cases in private practice.

	Hospital.	Private.	Total.
VIII. SYPHILIS—			
Primary ...	2	2	4
Secondary ...	52	13	65
Tertiary ...	98	49	147
Congenital ...	...	2	2
			218
IX.—			
Drugs, vaccines, antitoxins ...	29	1	46
X. CUTANEOUS AFFECTIONS IN GENERAL DISEASES—			
Varicella ...	12	1	13
Hæmophilia ...	..	2	2
Rotheln ...	..	1	1
			16
XI. TOXIC ERUPTIONS—			
Erythema ...	4	29	72
" multiforme ...	24	6	30
Urticaria ...	52	40	92
Purpura ...	...	1	1
" rheumatica ...	1	1	2
Acne rosacea ...	78	118	196
Lupus erythematosus ...	25	29	55
Lupus pernio ...	2	...	2
			450
XII. ERYTHRODERMIAS—			
Recurrent scarlatiniform ...	1	...	1
Dermatitis exfoliation ...	3	7	10
Exfoliation of epidermis ...	1	5	6
			17

XI. TOXIC ERUPTIONS—
Erythema, including multiform, accounts for 2 per cent. cases; Urticaria about 2 per cent.; Acne rosacea about 4 per cent. Though a number of cases of purpura occurred as in-patients, they are not recorded here.

XIII. AFFECTIONS DUE TO VASCULAR AND LYMPHATIC OBSTRUCTION—
 Ulcers of the leg are most numerous in this class, and, as might be expected, are twice as common in hospital as private practice—24 in 1,000 hospital and 12 in 1,000 private cases is the ratio of their occurrence.

XIV. NEURODERMATOSES—
 Pruritus in its various forms accounts for 4·6 per cent. of cases; Herpes zoster, 1·2 per cent. Almost twice the number occurred in hospital cases as in private.

XV. ERYTHEMATO-SQUAMOUS—
 Psoriasis accounts for 4·7 per cent. of cases, and occurs almost equally in hospital and private practice.

XVI. PAPULAR ERUPTION, UNKNOWN ORIGIN—
 Lichen planus appears to be more frequent in private practice than hospital, but is not a common disease, only totalling 6 cases per 1,000.
 There have been two cases of Granuloma annulare, both in children.

	Hospital.	Private.	Total.
XIII. AFFECTIONS DUE VASCULAR AND LYMPHATIC OBSTRUCTION—			
Varicose veins	3	8	11
Ulcer cruris	61	30	91
Raynaud's disease	...	1	1
Gangrene	...	...	...
Trophœdema	3	...	3
			106
XIV. NEURODERMATOSES—			
Pruritus, Pruritus tin, &c.	111	119	230
Prurigo	2	2	4
Lichen urticatus	7	9	16
Herpes	41	21	62
Dermatalgia	3	7	10
Atrophoderma	1	4	5
			327
XV. ERYTHEMATO-SQUAMOUS—			
Pityriasis rosea	9	9	18
Psoriasis	126	111	237
Derm. nervosa psoriatica	1	1	2
			257
XVI. PAPULAR ERUPTION, UNKNOWN ORIGIN—			
Lichen planus	14	19	33
Granuloma annulare	1	1	2
			35

		Hospital.	Private.	Total.
XVII. FOLLICULAR KERATOSES—				
Keratosis pilaris	...	2	7	9
Pityriasis rubra pilaris	...	...	1	1
Keratosis follicularis	...	...	1	1
				11
XVIII. PEMPHIGUS GROUP—				
Derm. herpetiformis	...	7	11	18
Hydroa gravidarum	...	...	1	1
Pemphigus chronic	...	...	2	2
				21
XIX.—VARIATION IN PIGMENTATION.				
UNKNOWN ORIGIN—				
Leucoderma	...	11	12	23
Chloasma	...	2	4	6
Yellow-ochre dermatitis; Pigmentation.	...	6	11	17
				46
XX. ATROPHY AND SCLEROSES—				
Patent sebaceous follicles	...	...	3	3
Senile degeneration	...	2	2	4
Scleroderma	...	...	3	3
				10
XXI. TUMOURS OF SKIN—				
Verrucae	...	7	28	35
„ seborrhoeic	...	...	9	9
Keratosis senilis	...	29	70	99
Cysts sebaceous	...	1	11	12
„ dermoid	...	1	...	1
Molluscum contagiosum	...	2	5	7
Papilloma	...	7	16	23

XVIII. PEMPHIGUS GROUP—
Dermatitis herpetiformis, 18 cases in 5,000, seems to be much more frequent in occurrence than in England, where Crocker's figures give 1 per 1,000.

XIX. VARIATION IN PIGMENTATION, UNKNOWN ORIGIN—
There have been several cases of Yellow-ochre dermatitis (Sabouraud) in this class.

XXI. TUMOURS OF SKIN—
It is in this division mainly that the effect of radiotherapeutics (above referred to) on the skin clinic is most noticeable, for here we enumerated the cases of keratosis, epithelioma, and rodent, also secondary carcinoma.
There are several cases of molluscum contagiosum; one case had as many as 60 small tumours, mostly on the abdomen and left arm.

XXI—continued.

Urticaria pigmentosa number 1 in 1,000, and there is also one well-marked case of Mycosis fungoides.

	Hospital.	Private.	Total.
Epithelioma ...	...	...	...
Rodent ...	17	75	92
Cylindroma ...	79	103	182
Carcinoma ...	...	2	2
Pagets' disease ...	7	20	27
Xanthoma ...	1	1	2
Urticaria pigmentosa ...	1	...	1
Mollicum gravidarum ...	...	5	5
Keloid, cicatrix ...	...	1	1
Rhinophyma ...	3	6	9
Calcareous tumours ...	...	2	2
Telangiectases ...	1	2	3
Cirsoid aneurism ...	1	36	37
Sarcomata ...	...	2	2
Mycosis fungoides ...	1	4	5
Multiple benign cystic epithelioma...	...	1	1
Epulis ...	1	2	3
			563

XXII. DISEASES OF THE APPENDAGES—

Alopecia ariata occurs in 1.5 per cent. of cases; all other alopecia 1.7 per cent.

Hirsuties almost 2.5 per cent. of private cases.

All affections of nails about 5 in 1,000.

XXII. DISEASES OF THE APPENDAGES—

Hyperidrosis ...	...	...	...
Bromidrosis ...	9	5	14
Sudamina ...	2	...	2
Dysidrosis ...	6	4	10
Trichorrexia nodosa ...	5	3	8
Alopecia ...	...	1	1
Alopecia areata ...	18	70	88
Hirsuties ...	28	47	75
Trichophobia ...	1	58	59
Affections of nails ...	1	2	3
	6	19	25
			285

RECENT EXPERIENCES IN SKIN CASES.

(INCLUDING ESPECIALLY A CASE OF MULTIPLE SARCOMA LIKE TUMOURS OF THE SKIN READILY YIELDING TO X RAYS.)

By C. AYRES, B.A., M.B., C.M.

UNDER this title I want to report specially one of the cases which has recently come under my care; but before doing so I will briefly describe the technique and apparatus which I employ, both privately and in hospital—St. Vincent's, Sydney. In my private practice I use a gaiffe 16-inch coil, getting the current, which is continuous, from the city main at 240 volts, and using a shunt resistance, which cuts down the current to any required voltage up to 120. I have two interrupters and a turn-over switch, which enables me to use at will either a gaiffe automatic mercury gas turbine or a one-point wchnekt. Of the two I prefer the former, and find that the use of gas, instead of spirit, as the dielectric is preferable in every way. For cutting out the inverse current I use a spark-gap rectifier, the point and disc being placed inside a large bell glass jar to lessen the noise of sparking. Although I am aware that it has been said that a spark-gap rectifier is of no use because the discharge between the terminals partakes of the character of an arc which does not rectify, yet practically I find it just as efficient and satisfactory as a valve tube, and requires much less attention to keep it in order. Other portions of the installation comprise a volt-meter, an ampere-meter, a spinter-meter, a milliamperemeter, and Belot's shield and universal stand. This shield I find very convenient indeed. The tube can be accurately centred, and the pastille can be placed at the proper distance from the target, and the localisers, of different sizes, can be readily applied to the affected part. The only slight objection I know to Belot's shield is that only small and moderate-sized tubes can be used in conjunction with it. As regards tubes, I find the Chabaud, the Drissler, Deane's therapeutic, and Müller's therapeutic all very satisfactory; and for dosage I use Sabouraud's pastilles. I would like to mention here that Butcher says it has been repeatedly shown that a "pastille" dose—*ie.*, the quantity of X-rays required to produce a given colour-change in Sabouraud's pastille—is only equivalent to an "erythema" dose when rays of No. 5 hardness (Benoist scale) are used. If that is so, I have not been aware of it till recently, always having believed that a "pastille" dose is equivalent to an "erythema" dose, whatever the quality of rays used. In my hospital (St. Vincent's, Sydney) the current is alternating. There can be no doubt that it is more difficult to install and use a current when alternating than when continuous. In order to render the current as unidirectional as possible it is necessary to employ an aluminium valve cell, as well as a rectifying valve tube. The other portions of the installation are practically the same as those already mentioned.

The first case which I wish to bring specially under your notice is that of a young man, 29 years of age, and an orchardist by occupation. About December, 1910, whilst in his usual state of health, and not being aware of any cause for their appearance, he noticed several reddish blotches on each temple. These soon began to swell, and formed tumours of a dusky, bluish-red colour, the largest being on the right temple, about the size of a goose-egg, and projecting from the surface to the extent of about 1 inch. Speedily similar blotches, developing into dusky, bluish-red tumours, appeared on both sides of the face—one below each eye—two on the back of the neck, several on each side of the body, about ten of various sizes on the back and on the inside of the legs, but none on the chest or abdomen. About March of this year, 1911, both testicles began to enlarge, and increased to about the size of a large lemon. The skin of the scrotum was normal in appearance, and non-adherent to the testicles, which were felt to be hard, and to have a smooth and regular surface. The cords were not affected.

Up to the time these swellings began to appear he had always been a healthy man. His personal as well as his family history is good. On examination, all his systems were found to be normal. Examination of the urine, normal; blood count (made late in treatment), practically normal; red cells 4,900,000, white 11,500; differential count, polymorphonuclear 76 per cent., mononuclear 24 per cent; so that there is only a slight leucocytosis, affecting chiefly the mononuclear element; Wasserman reaction negative. His general health has not in any way deteriorated, nor has he had any pain or itching in connection with any of the swellings. One of the swellings on the back was excised and examined microscopically, both at the University and the Bureau of Microbiology. Dr. Cleland says the appearances of the section are those of a round-cell sarcoma. There are masses of round cells with largish nuclei, many of which are mitosing, and there is a scanty stroma of connective tissue. He further informs me of the interesting fact that a section of one of the infective venereal tumours of dogs resembles the sarcoma-like appearance of the present specimen. These tumours in dogs are well known to be transmitted by coitus, and though histologically round-cell sarcomata, they are probably due to some as yet undiscovered organism (vide Imperial Cancer Research Fund, 3rd Report). The diagnosis of multiple non-pigmented sarcomata of the skin was therefore made, and the prognosis given bad; no cause could be discovered. He has never taken drugs, such as iodine, arsenic, &c. No medicine was given, but treatment with X-rays was begun in July, applying them first to the testicles. I may mention here that none of the lymphatic glands in the body were enlarged, except perhaps one small one in left side of neck, nor was the spleen enlarged. Bearing in mind the possibility of the occurrence of toxæmia, I only gave small doses at intervals of several days, using a small Müller tube at 8 inches and a current of 1 milli-ampere. The testicles almost immediately began to decrease in size. Then I applied the rays to the large swelling on the right temple, and after two or three small doses was surprised to find that it

gradually disappeared; so with the rest of the swellings. They have all practically disappeared, leaving only pigmented and slightly depressed skin areas behind to mark their former sites. I have never seen a case quite like this, nor have I ever heard of tumours like these disappearing so rapidly under the influence of the X-rays. Kassabiau says he cannot believe that many X-ray operators have achieved brilliant results with the X-rays in this disease. In many instances where brilliant results were achieved in irradiation of sarcomata, in all probability there was either a mistake in the diagnosis and a less malignant affection was present, or else the operators were a little too enthusiastic when making their reports. Some other authorities say that many cases of the disease are favourably influenced by X-ray applications, and a few cases have, perhaps, been permanently cured. Most cases, however, die within two years of the first appearance of the tumours. However, in this patient the tumours have disappeared almost like magic under the influence of X-rays. Owing to this rapid disappearance of the tumours under the influence of the X-rays and the decrease of the size of the testicles, I became somewhat suspicious of the diagnosis of sarcoma. Yet the microscopical section undoubtedly shows an appearance of round-celled sarcoma. The cells are somewhat larger than lymphocytes; many of them are seen to be mitosing, and they are invading the fat trabeculae and muscle. Lymphocytes do not ordinarily mitose, nor do they present the appearances as here shown. Then, again, the testicles are involved; if they were sarcomatous, one would expect some irregularity of surface and contour. On clinical grounds, therefore, and from microscopical appearances, one would say they are sarcomata, and probably of the nature of multiple idiopathic hæmorrhagic sarcoma of kaposi, or the simple hypodermic round-celled sarcoma of Perrin type. On the other hand, there are sarcoma-like tumours occurring in acute leukæmia and in pseudo-leukæmia, or Hodgkins' disease; but in the former, in which these tumours chiefly occur, there are other conditions present, as anæmia, enlarged spleen, enlarged lymphatic glands; and the skin tumours are composed chiefly of crowded and heaped-up lymphocytes in the corium and subcutaneous tissue. Biesiadecki first described these leukæmic tumours of the skin in 1876. Pinkus believes that these leukæmic tumours represent hyperplasias of foci of lymphoid tissue normally present in the skin. Whether there are such foci normally in the skin I cannot say, and if there are why they should take on this sarcoma-like growth I cannot imagine. If they are leukæmic tumours on the skin, Pusey says, on the point of treatment, that in view of the remarkable effect of X-rays upon the deeper-seated tumours in leukæmia, it is probable that they would quickly dissolve the lesions of the skin. Crocker says that these tumours may precede or follow the leukæmia. Taking everything into consideration, I think these sarcoma-like tumours of the skin most closely resemble Kaposi's multiple idiopathic hæmorrhagic sarcoma, in which the pigmented condition is due to vascular conditions and blood pigment, but also resemble the leukæmic tumours of the skin preceding the leukæmia itself. This is the only case which I can find in which both testicles are affected.

I would like to group together the conditions in which sarcoma-like tumours, more or less resembling these in my case, occur in the skin:—

1. Non-pigmented simple hypodermic and symmetrical round-celled sarcomata, Perrin type. It is said that it is probably this type that is occasionally arrested by the administration of arsenic or the use of X-rays.
2. Multiple idiopathic hæmorrhagic sarcomata, Kaposi type.
3. Sarcomatosis cutis, Kaposi third type.
4. Multiple benign sarcoid of Boeck.
5. Sarcoma-like humour in leukæmia.
6. Pseudo-leukæmic tumours (Hodgkins' disease).
7. Mycosis fungoides.
8. Lymphodermia perniciosa of Kaposi, described in 1855. Beginning as an oozing eczema, which he thought approached to the case of Biesiadecki, in which there was true leukæmia.
9. The venereal tumours of dogs.

Altogether the case is one of great importance and interest clinically, pathologically, and therapeutically, and I am very glad to have had the opportunity of reporting the case, and of showing the patient to the members of this section.

By way of contrast with this case, so far as treatment by X-rays is concerned, I would like to mention one or two other cases, notably a small melanotic sarcoma on the inner side of the foot, and a case of the fixed discord variety of lupus erythematosus. In neither of the said cases did the X-rays do any good, whilst on the other hand, in cases of acne necrotica on the back, I have found benefit result from the use of X-rays in acne vulgaris of face, even small doses often produce good results, because, as I think, of their action on the sebaceous glands. I have treated a few cases with radium, and do not wish for a nicer method of treatment, especially in rodent ulcer, warty growths, and small capillary and cavernous nævi. Darier has pointed out the advisability of doing a biopsy in every case presenting the appearance of rodent ulcer or epithelioma, because microscopically a distinction can be made out between rodent ulcer or l'Épithéliome tubulé, as he calls it, and true epithelioma with cell nests or l'Épithéliome lobulé. The former, he says, can be cured by X-rays, radium, carbonic snow, cautery, &c., whereas in the latter the best and only proper form of treatment is surgical excision.

As to whether X-rays will cure true epithelioma, I am not certain, as the destructive action of X-rays do not ordinarily reach beyond from $1\frac{1}{2}$ -2 cm.; and yet I believe that, with proper screens, such intense and penetrating rays will be obtained that there will be no difficulty in curing it.

As regards radium, I think there is no doubt that it does cure squamous-celled epithelioma, prickle-cell carcinoma—that is, cancer of the skin—and that probably with larger amounts of radium used in treatment, that other carcinomata will also be cured.

Now a word or two on filters, screens, or transformers, as they are variously called. Sir J. J. Thompson recently described Professor Barkla's discovery in connection with secondary X-rays. He found that when X-rays strike any object, secondary rays of a perfectly definite quality are given out, provided that the exciting X-rays are harder than the secondary X-rays, peculiar to the object, so that it is possible to get a monochromatic beam of rays, varying in hardness according to the particular metal used as the transformer. But he did not say anything in reference to the intensity of the secondary X-rays with variation in the thickness of the metal or increase in the hardness of the exciting rays. I have recently been trying experiments with copper, aluminium, nickel, and silver screens, and have come to the conclusion that though the quality of the secondary rays depends on the particular metal used, that the intensity is increased by using a thicker plate, and decreased by an increase in the hardness of the exciting rays. Belot says aluminium is the best of all filters, others think silver is the best. Longlot Johnston has found in the case of radium screens that where a thin screen seems only to stimulate and irritate without curing, that a thicker screen of the same metal will bring about a cure. I believe this holds good also in the case of X-ray screens.

Finally, I desire to say a word in favour of the more extended use of Brocq's method of clinical diagnosis of some skin cases, by the slow and methodical use of the small skin curette. This method of diagnosis, "*par le grattage*," is of great assistance in some cases—e.g., psoriasis, papulosquamous syphilide, and pityriasis rosea, which at times resemble one another closely. The curette is held gently between the thumb and index fingers, and the primary scaly lesion is slowly scraped. In the case of psoriasis, after removing the superficial scales, the curette reaches a thin membrane, "*le dernier pellicule*," which consists of the adherent lowest cells of the stratum corneum, and which can be removed in one piece by the curette. Beneath this is the smooth shining surface of the rete malpighii, and, as the papillæ are close to the surface, the curette soon scrapes the tops of the papillæ, and characteristic hæmorrhagic points appear.

In the case of the papulosquamous syphilide the curette, after removing the superficial scales, does not find the thin detachable pellicle as in psoriasis, but on further scraping purpuric points appear, because the diseased vessels of the dermis are injured by the curette before the epidermic layer is completely scraped through, then on further scraping sheet hæmorrhage results, and not the characteristic hæmorrhagic points.

Another disease which resembles, and may be mistaken for syphilis, is pityriasis rosea. Here, on scraping away the superficial scales, the curette does not disclose the thin detachable pellicle, but opens up a ring of minute vesicles at the periphery of the lesion. These give out serum, and on pressing fine cigarette paper down on this the ring of serosity is shown on it. This is characteristic of this disease, and is not shown by any other skin lesion.

SALVARSAN.

(Report to the Chief Medical Officer of Government on Treatment with Salvarsan.)

By R. J. MILLARD, M.B., C.M. (Syd.), D.P.H. (Cam.),

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Reformatory for Women.

Report on 170 Cases treated with Salvarsan.

PART I.

INTRODUCTORY.

“SALVARSAN” is the trade name for a preparation of Arsenic which has been produced by Professor P. Ehrlich, Director of the Institute for Experimental Therapeutics at Frankfort, in collaboration with Dr. Bertheim and Dr. Hata, as a result of chemical and biological researches extending over several years. The idea of using Arsenic in the treatment of Syphilis was not new. Especially since 1903, when Laveran published the observation that arsenical preparations had a lethal effect on trypanosomes, these preparations, under the names of Atoxyl, Soamin, Arsacetin, Cacodylates, had been extensively used in trypanosome diseases such as Sleeping Sickness, and also in Syphilis, which Schaudinn had shown to be due to a somewhat similar protozoan parasite, the *spirochæta Pallida*. But the therapeutic effects obtained were not convincing, and it was found that all these compounds were open to the objection that in a considerable proportion of cases they produced toxic arsenical effects on the optic and other nerves, and abdominal symptoms.

Alive to these objections, Ehrlich set out to produce synthetically a compound which should have the maximum effect on the parasite (maximum parasito-tropism). and the minimum effect on the organs of the body (minimum organo-tropism). Using Atoxyl as a starting-point, and after an exact determination of its chemical composition, he found that he could synthetically obtain an infinite number of compounds in which the relative degrees of parasito-tropism and organo-tropism varied according to the chemical composition. With many hundreds of such compounds he experimented on animals—especially mice, rats, and fowls infected with spirilla of several species, and rabbits infected with Syphilis. Thus was gradually evolved the product at first designated No. 606, the chemical composition of which is expressed by the title Dioxy-diamido-arseno-benzol, and which as above stated has for convenience been named “Salvarsan.”

The behaviour of these chemical compounds towards the trypanosomes and spirilla is explained by Ehrlich's theory that the individual cells of the parasites have what he calls “chemical receptors” of many kinds, with affinity or attraction for corresponding chemical compounds. Thus one trypanosome possesses an Acetic receptor and consequently attracts and attaches to itself an acetic compound of arsenic; others with Iodine receptors attract Iodine compounds.

To quote the words of Hata* : " Only those receptors are of importance whose affinity for the corresponding atom groups of the chemical compound is considerably greater than that of the similar receptors in the organism of the host. . . . In the Spirochætes, the most importance attaches to—(1) the Arseno ceptor and (2) the Oxyamido ceptor. . . . In Dioxy-diamido-arseno-benzol we have a means by which to seize the two receptors in the Spirochætes in such wise that the parasites are readily killed in the body of the animal without danger to the latter."

The animal experiments proved the superiority of Salvarsan over the other arsenical compounds tested. Thus in Chicken Spirillosis it was found that whereas Atoxyl effected a cure only when given in a dose equal to half the maximum that could be tolerated, *i.e.*, Dosis Curativa = $\frac{1}{2}$ Dosis Tolerata, or $\frac{c}{t} = \frac{1}{2}$; for salvarsan $\frac{c}{t} = \frac{1}{58}$; that is, the curative dose of salvarsan was only $\frac{1}{58}$ the dose which could be tolerated.

And in Rabbit Syphilis it was found possible to effect a cure, *i.e.*, cause the disappearance of all Spirochætes, in two days with one intravenous injection of a dose $\frac{1}{6}$ of the Dosis Tolerata. With larger doses, equal to $\frac{1}{7}$ and more of the Dosis Tolerata, the Spirochætes disappeared absolutely from the scrotal chancre in less than twenty-four hours.

Having proved its efficiency as regards the lower animals, Ehrlich now took steps to have his new compound tested in human Syphilis by the most competent observers, before allowing it to be made available to the medical profession generally. With this view he distributed over 60,000 doses gratis to medical men of the highest standing in Germany and in other lands, inviting their co-operation in testing the therapeutic value of the drug in Syphilis, and only stipulating that they should in return report to him their experiences and opinions.

Only after this programme had been rigidly carried out for some nine months, and he had, from the reports of some 20,000 to 30,000 cases, satisfied himself as to the action of the drug, the indications for its use, and the contra-indications, the doses, and the dangers, did Ehrlich, in December, 1910, allow it to be put on the market. The reports received had been an almost unanimous chorus of enthusiasm for the new drug and the wonderful changes which it wrought in all stages of syphilis. The enthusiasm and interest aroused had been world-wide, and the German clinics had been besieged by medical men of all nations, anxious to witness the miraculous effects which were being obtained.

In an address delivered at Frankfort on 8th December, 1910—Die Salvarsantherapie: Rückblicke und Ausblicke (Salvarsan treatment: Retrospect and Outlook)—Ehrlich examines the data then available. He first meets the principal criticisms of the treatment:—

1. That Salvarsan might produce blindness. In 25,000 cases treated by Salvarsan, he could learn of but one authenticated case of affection of the vision. This was a case of malignant syphilis under Finger of Vienna. She had recently been treated energetically with other arsenic preparations, and three months after an injection of Salvarsan developed neuro-retinitis, with dimness of vision, &c. Ehrlich considered that the previous

* Ehrlich and Hata " Die Experimentelle Chemotherapie der Spirillosen," p. 84.

treatment was sufficient to contra-indicate the use of salvarsan, and, apparently regarding this case as "the exception which proves the rule," concludes that Salvarsan *per se* has no harmful effect on the eye.

2. That the Auditory and other nerves may be harmfully affected. By special inquiry he obtained details on this point concerning 7,000 cases treated with Salvarsan, and among these found nine cases which showed symptoms of Auditory nerve lesions. These nine cases were all of early Secondary Syphilis, and all had received single subcutaneous doses of Salvarsan. He concludes that these lesions were due not to Salvarsan, but to Syphilis, chiefly on the following grounds:—

- (i) Similar lesions have been recorded in early Syphilis treated by mercury only.
- (ii) No cases which had been thoroughly treated with Salvarsan showed these symptoms.
- (iii) In some of these cases, the auditory lesions were cured by further injection of Salvarsan. Had the lesion been due to Salvarsan, the further injection would have aggravated it.

3. As to the general toxicity of Salvarsan he premises that no preparation which is to exert an active effect can be wholly free from danger. With regard to Salvarsan, he from the first issued warnings against its use in cardiac degeneration, aneurism, apoplexy, severe nephritis, diabetes, gastric ulcer, old age. But in the enthusiasm to use the remedy these warnings were often disregarded, and most unsuitable cases, some already at the point of death, were injected with Salvarsan. Excluding such deaths as obviously not chargeable to the account of Salvarsan, he finds in the reports of over 25,000 cases only five deaths; and even in these, four had heart disease in some form, and the fifth had disease of both liver and kidneys. The data obtained go to show that in properly selected cases, that is, with the exclusions recommended by Ehrlich, the use of Salvarsan is singularly free from danger.

4. On the question of the permanence of the cure effected, Ehrlich says that judgment must necessarily be reserved for the present, as the disease notably has a very chronic course, and the new treatment has been under observation less than twelve months. But regarding the relapses, evidenced by return of symptoms and an enduring or returning positive Wassermann reaction, he points out that these have occurred mostly after insufficient doses, and after administration of the drug in insoluble form. Even so, such relapses form a very small proportion of the many cases treated, and all observers have found it very difficult to keep in touch with these cases after treatment, so completely as a rule have all symptoms disappeared. He does not claim, and never has done so, that every case of Syphilis can be cured by a single injection of Salvarsan—the "Therapia Sterilisans Magna" which has been found practicable in animals affected with Spirillosis, and even in man in Recurrent Fever—but he hopes that this can be done by judiciously repeating the doses. Further, he suggests that to attain this end it may be desirable to combine with Salvarsan treatment the use of the older remedies, Mercury and Iodide.

PART II.

The first supply of Salvarsan came to hand in February last, and at the same time, very opportunely, Dr. A. E. Finckh (Hon. Pathologist to the Sydney Hospital) returned from Germany with all the latest information on the subject of Salvarsan therapy. At much personal inconvenience to himself, Dr. Finckh co-operated with me in the treatment of the first seventy cases at the Coast Hospital, and also made all the Wassermann tests up to the end of May, after which the Bureau of Microbiology undertook the work. I should like here to express my indebtedness to him for making freely available to me the experience and literature which he had brought with him from Germany.

The series of cases on which I have to report number 170, the first of which was injected on 25th February, 1911, and the last on 1st August. I have tabulated a brief summary of each case, showing the clinical condition before Salvarsan treatment, the results obtained as far as known to me up to the time of writing this (10th August), and also, in the majority of cases, some results obtained by the application of the Wassermann test. In another column of the table I show also the gain in weight where this has been recorded, as furnishing evidence of the effect on general nutrition.

Methods of administration.—In the earlier part of the series subcutaneous and intramuscular injections were used, as well as intravenous, but for the last 105 cases, and for all the second and third injections, the intravenous method alone has been used. The following table details this more explicitly :—

First Injection.	Second (intravenous).	Third (intravenous).
<i>A. Subcutaneous—</i>		
(i) Suspension ... 12	5	...
(ii) Alkaline Solution 13	3	1
(iii) In Parolein ... 10	6	...
<i>B. Intramuscular</i> ... 6	3	1
<i>C. Intravenous</i> ... 129	78	6
Total cases ... 170	95	8

Technique.—The technique of these methods is as follows :—

A. Subcutaneous Methods.

- (i) Suspension.—The contents of a tube of Salvarsan (.6 g.) are rubbed down in a mortar with an equal quantity (.6 c.c.) of Sodium Hydrate, 15 per cent. solution. Then sterile distilled water, 2 c.c., and finally Normal Saline, 5 c.c. are added. Injection is made between the scapulæ, strictly *subcutaneously*, and by two punctures, a separate needle (of fairly wide bore) being used for each puncture, and plunged in before the syringe is attached, so as to minimise the risk of introducing salvarsan in the needle track through the skin, where it might cause necrosis.

- (ii) *Alkaline Solution*.—The contents of a tube are dissolved in 8 c.c. of hot sterile distilled water, and to the clear acid solution thus obtained Sodium Hydrate 4 per cent. is added, in the proportion of .5 c.c. for each .1 g. of Salvarsan dissolved. The addition causes a yellow turbidity, which gradually clears. The resulting clear solution is injected in the same manner as described above for the Suspension.
- (iii) *In Parolein*.—The Salvarsan is intimately rubbed down in a mortar with Parolein in such proportions that 1 c.c. of the resulting mixture contains .1 g. of Salvarsan. The syringe and needle used for injection must be scrupulously dried with ether, else there is a probability of the piston becoming almost immovably jammed in the syringe barrel. The injection is made subcutaneously in the interscapular region. The needle should be thrust in before the syringe is attached. This obviates the risk of injecting into a blood-vessel, and also, as above stated, lessens the risk of leaving Salvarsan in the needle track.

B. Intramuscular.—For these injections the Salvarsan is suspended in either Parolein or Olive Oil, being mixed in a mortar by the same method and in the same proportion as just described, namely, so that 1 c.c. contained .1 g. of salvarsan. The injections were made deeply into the gluteal muscles, the needle being plunged in before the syringe was attached.

C. Intravenous.—For this it is necessary to prepare a dilute, slightly alkaline, clear solution of Salvarsan. The contents of a tube are dissolved in about 30 c.c. of hot saline, complete solution being facilitated by having some glass beads in the bottle. To the acid solution thus obtained, Sodium Hydrate is now added in sufficient proportion to produce, first, a turbidity, and then a clear yellow solution. For this purpose one must add either 4.2 c.c. of normal (4 per cent.) Sodium Hydrate, or 1.3 c.c. of Sodium Hydrate 15 per cent., to a solution of .6 g. Salvarsan. The alkaline solution is now filtered into a measuring cylinder, and diluted with normal saline up to 200 c.c. For administration, I have always used an infusion apparatus, consisting of two glass vessels delivering from the bottom, and each connected by a rubber tube to a glass Y-piece, from the lower limb of which another rubber tube leads to the needle. Pieces of glass tubing, inserted at convenient points, serve as windows through which the flow can be observed. The vessels are suspended at a suitable height above the patient, to ensure the necessary flow. For this purpose I have latterly had a frame made which I attach by a cord to a pulley in the ceiling, or (in the wards) to the bedstead head. One vessel receives the Salvarsan solution, the other and the tubing are filled with normal saline, and all air thereby expelled. Clips are placed on each tube leading from the glass vessels. The patient being recumbent, a tourniquet is applied above the elbow to distend the veins, and the needle with saline actually flowing through it is plunged into the vein which appears most suitable. As this is done, the assistant promptly releases the tourniquet. If the needle be fairly in the lumen of the vein the saline continues to flow, without producing any subcutaneous tumour. If the needle is not properly in the vein, either the flow of saline ceases, or a subcutaneous tumour

forms, and the needle must be withdrawn. When it is certain that the needle is in the vein, the saline is turned off, and the Salvarsan solution simultaneously turned on. The infusion of the Salvarsan solution commonly occupies about five minutes, after which saline is again turned on to flush out the tube, ensuring that the patient receives the whole dose, and also that when the needle is withdrawn no Salvarsan is left in the needle track, where it might cause sloughing. The whole time occupied in mixing and infusing is generally about twelve minutes if the veins are easily accessible. In fat arms, especially in women and children, it may be very difficult to strike the vein in the manner above described, and for such cases it is necessary to expose the vein by incision, preferably under local anæsthesia, *e.g.*, by beta eucain.

In all cases the urine is carefully tested for albumen before injection, and the patient receives an aperient on the previous night. For some hours before injection no food is given. After injection the patient is kept in bed for at least twenty-four hours, and for longer if there be any unfavourable symptoms. The strictest asepsis is observed in preparing and injecting the dose.

Dosage.—As a general rule, the initial dose used for adult males was .6 g. For females, and for certain other cases, *viz.*, locomotor ataxy (Cases 45 and 46), urinary trouble (Cases 133 and 141), cerebral thrombosis (Case 142), paraplegia (Case 151), pernicious anæmia (Case 162), only .3 g. was given. A child aged 18 months (Case 83) received an initial dose of .08 g., and subsequent doses of .12 g.

When parolein, or olive oil, was used as a vehicle for the Salvarsan, the dose, either subcutaneous or intramuscular, was .2 g., repeated every second day, in some cases for five injections.

As to second intravenous injections, I have latterly, following McDonagh,* adopted the practice of giving a second injection of .6 g., 7–10 days after the first. I am doubtful, however, whether a full dose should be given so soon. Perhaps it would be better practice to give a second and third dose of .3 g. only, say ten and seventeen days respectively after the initial full dose.

Immediate after effects.—Subcutaneous injections of either the suspension or the alkaline solution caused intense pain as a rule, the patient describing it as like a crushing in of the chest wall. With this pain there was usually rise of temperature, and often vomiting.

The parolein subcutaneous injections were much less painful.

The intramuscular injections were not at once painful, but in twenty-four hours, or more, there was usually pain of varying intensity down the thigh, and this in some cases lasted for many weeks.

The intravenous injection of .6 g. usually caused a rigor, with temperature perhaps up to 103°, vomiting, headache, and some diarrhœa. These symptoms generally began 3–4 hours after the injection, and had all ceased within twenty-four hours.

“Herxheimer’s reaction,” *i.e.*, an exacerbation of the rash, in some cases of periostitic pain, and in one case of the pain in an enlarged gland, was recorded in nine cases (Cases 3, 11, 20, 52, 57, 58, 59, 62, 112), but

* Ehrlich and McDonagh, “606 in Theory and Practice,” p. 53.

probably occurred more frequently than these figures would suggest. Pyrexia extending over several days occurred in Cases 47, 124, 129, and 158. The last-named case, a weedy youth of 19 years, was seriously ill for seven days after his second injection of .6 g. (he had had the same dose seven days before). His temperature remained at about 103° , pulse weak, tongue thickly coated with a creamy fur, and there was diarrhoea for some days; two days after injection he developed a bright red blotchy rash on head, trunk, and limbs.

Case 124 developed a purpuric eruption after the first injection, and a bright erythema after the second, and his temperature was high for some days.

Elimination of arsenic by the urine.—In order to get some data on this point, the urine of six cases—Nos. 55, 74, 75, 76, 82, 84—was collected each day for several days after intravenous injection of Salvarsan, and was sent to the Government Analyst (Mr. W. M. Hamlet, F.I.C., F.C.S.), to be examined for the presence of arsenic. The following is a brief summary of the results obtained :—

Case 55—

May 26, 10 a.m.—*Salvarsan, .6 g. intravenous.*

„ 26	Urine to 6 p.m., contained Arsenic	... ..	Strong trace.
„ 27	Urine for 24 hours to 6 p.m., contained Arsenic	...	Trace.
„ 28	„ „ „ „	...	Faint trace.
„ 29	„ „ „ „	...	Nil.
„ 30	„ „ „ „	...	„
„ 31	„ „ „ „	...	Faint trace.
June 1	„ „ „ „	...	„ „

Case 74—

May 12, 3 p.m.—*Salvarsan, .6 g. intravenous.*

„ 13	Urine for 24 hours to 6 p.m., contained Arsenic	...	Strong trace.
„ 14	„ „ „ „	...	„ „
„ 15	„ „ „ „	...	„ „
„ 16	„ „ „ „	...	„ „
„ 17	„ „ „ „	...	„ „
„ 18	„ „ „ „	...	„ „
„ 19	Sample not sent.		
„ 20	Urine for 24 hours to 6 p.m., contained Arsenic	...	Faint trace.
„ 21	„ „ „ „	...	„ „
„ 22	„ „ „ „	...	Trace.
„ 23	„ „ „ „	...	Faint trace.
„ 24	„ „ „ „	...	„ „
„ 25	„ „ „ „	...	„ „

Case 75—

May 12, 2.30 p.m.—*Salvarsan, .6 g. intravenous.*

„ 13	Urine for 24 hours to 6 p.m., contained Arsenic	...	Faint trace.
„ 14	„ „ „ „	...	„ „
„ 15	„ „ „ „	...	Strong trace.
„ 16	„ „ „ „	...	Trace.
„ 17	„ „ „ „	...	„
„ 18	„ „ „ „	...	Strong trace.
„ 19	„ „ „ „	...	Nil.

Case 76—

May 19, 2 p.m.—*Salvarsan*, .6 g. intravenous.

20	Urine for 24 hours, ending 6 p.m., contained Arsenic...	Faint trace.
21	Sample not sent.	
22	Urine for 24 hours, ending 6 p.m., contained Arsenic...	Trace.
23	" " " " " " ...	Strong trace.
24	" " " " " " ...	Trace.
25	" " " " " " ...	Faint trace.

Case 82—

May 23, 3 p.m.—Salvarsan, .6 g. intravenous.

May 23, 3 p.m.	Saturated, 3 g. uric acid.						
" 24	Urine for 24 hours, ending 6 p.m., contained	Arsenic...					Trace.
" 25	"	"	"	"	"	"	Faint trace.
" 26	"	"	"	"	"	"	Nil.
" 27	"	"	"	"	"	"	Strong trace.
" 28	"	"	"	"	"	"	Trace.
" 29	"	"	"	"	"	"	Strong trace.
" 30	"	"	"	"	"	"	Faint trace.
" 31	"	"	"	"	"	"	Minute trace.
June 1	"	"	"	"	"	"	" "
" 2	"	"	"	"	"	"	Nil.
" 3	"	"	"	"	"	"	"
" 4	"	"	"	"	"	"	"
" 5	"	"	"	"	"	"	"
" 6	"	"	"	"	"	"	Trace.

Case 84—

May 26, 10:30 a.m.—*Salvarsan*, .6 g. intravenous.

„	26	Urine to 6 p.m., contained Arsenic	...	...	...	Strong trace.
„	27	Urine for 24 hours, ending 6 p.m.	...	...	...	Trace.
„	28	No sample.				
„	29	Urine for 24 hours, ending 6 p.m., contained Arsenic...				Faint trace.
„	30	„ „ „ „ „ „				Nil.
„	31	„ „ „ „ „ „				Faint trace
June	1	„ „ „ „ „ „				Very faint trace.
„	2	„ „ „ „ „ „				„ „
„	3	„ „ „ „ „ „				„ „
„	4	„ „ „ „ „ „				„ „
„	5	„ „ „ „ „ „				Nil.
„	6	10 a.m.— <i>Salvarsan</i> , 6 g., <i>intravenous</i> (second injection).				
„	6	Urine to 6 p.m., contained Arsenic	...	...	...	Faint trace.
„	7	Urine for 24 hours, ending 6 p.m., contained Arsenic...				Very strong trace.
„	8	„ „ „ „ „ „				Faint trace.
„	9	„ „ „ „ „ „				Very strong trace.

These results, such as they are, serve to indicate—

1. That elimination of arsenic by the urine begins very soon.
2. That it proceeds irregularly.
3. That it may extend over as much as 14 days after an intravenous injection of .6 g. (Case 82).

The last point is perhaps of the most importance practically, since it suggests caution in giving a second dose less than fourteen days after the first. Nevertheless, McDonagh* recommends a second injection 5-7 days

* Ehrlich and McDonagh, *loc. cit.*

after the first, and, as will be seen by reference to the table, many of the cases in this series received the second dose on the 7th day after the first, without any harmful results.

Remote after-effects.—The subcutaneous injections by any of the methods above mentioned commonly cause a local swelling, which may last for several months, and which may be accompanied by local sloughing of the tissues at the site of injection. In the present series there have been instances of this even after use of the Parolein injection. The slough is tough and adherent, and the resulting sore consequently takes a long time to heal. This circumstance, together with the immediate pain caused by the injection, has led to the almost universal abandonment of the subcutaneous in favour of the intravenous method of administration.

Effects on organs of special sense.—So far the only case in which any suspicion arose that the drug had had a harmful effect on a special-sense organ has been Case No. 54. This was a man of 51 years, suffering from early Secondary Syphilis, who had an intravenous injection of Salvarsan .6 g. on 2nd April, and on 19th May, had right-sided headache and paresis of the left external rectus, causing diplopia when he looked to the left side. He was examined by Dr. Gordon MacLeod (Honorary Consulting Oculist to the hospital), who considered that the diplopia was as likely to be due to Syphilis as to Salvarsan, and advised reinjection. A second injection (.6 g. intravenous) on 28th May was followed by disappearance of the headache, but the diplopia remained unimproved up to his discharge on 14th July.

Deaths after an injection of salvarsan.—Of the 170 cases comprised in the present series, four (4) have died during the period covered, namely, 25th February to 10th August. These were Cases 28, 95, 96, and 161.

Case 28.—A woman, aged 55 years, a chronic alcoholic, had suffered from Syphilis for many years. On 16th March she was given a subcutaneous injection of Salvarsan .6 g. in alkaline solution. This caused the usual severe pain, but the syphilitic lesions cleared up rapidly and her general condition improved greatly. On 17 May, nine weeks after injection, she began to have diarrhoea, with occasional vomiting. This persisted despite treatment, and she eventually died on 29th May. Post-mortem examination showed well marked ulcerative colitis. The injection sites showed much fibrous thickening, and the fibrous capsules thus formed still contained some yellowish granular material resembling Salvarsan. Chemical analysis obtained no arsenic in this material, and only traces in the liver. It appears doubtful whether the intestinal ulceration is to be attributed to the disease or to the drug.

Case 95.—Man, aged 50 years, with Tertiary Syphilis. Injections on 2nd June and 14th June were followed by healing of extensive ulceration of legs, but on 27th June he had a sort of "faint," subsequently became comatose and eventually died on 3rd July. Post-mortem examination showed broncho-pneumonia, degenerated cardiac muscle, cirrhotic liver, and a condition of chronic pachy- and lepto-meningitis. There were no signs of irritant poisoning. The spleen, liver, and kidneys contained "traces" of arsenic.

Case 96.—Man, aged 39 years, with transverse myelitis and paraplegia. Injection of Salvarsan .6 g. on 4th June, produced no change in his condition. He developed very extensive bedsores and hyperpyrexia, and died on 16th July. No post-mortem examination.

Case 161.—Woman, aged 48 years. Tertiary Syphilis, with strongly positive Wassermann reaction. Left femoral thrombosis and bronchopneumonia. She was in a very low condition when admitted on 13th July, and as she made no improvement on ordinary treatment, salvarsan .3 g. was given on 27th July. This had no effect on her symptoms, and she gradually sank and died on 10th August.

It appears doubtful whether any of these deaths are attributable to Salvarsan, certainly not the last two, I think.

Therapeutic effects obtained.—The 170 cases of the series may be classified as follows :—

Primary Syphilis	...	...	...	...	10 cases.
Secondary	...	...	...	...	106 „
Tertiary	...	...	...	...	44 „
Congenital	...	...	...	...	3 „
Locomotor Ataxy	...	...	...	...	2 „
Spinal Myelitis	...	...	...	...	1 „
Leprosy	...	...	...	...	1 „
Anæmia	...	...	...	...	2 „
Sycosis Menti	...	...	...	...	1 „

—
170 cases.

The effects obtained may be most conveniently described by taking these classes in order.

Primary syphilis.—Ten cases. In all of these cases the chancres became painless within twenty-four hours of the first injection, and began to heal rapidly. In five cases healing was complete within fourteen days; in two with more extensive chancres it took longer; two had the chancres removed by circumcision; and one insisted on leaving the hospital seven days after injection with the chancre practically healed, declining a second injection.

Secondary syphilis.—106 cases. Most of the symptoms characteristic of the secondary stage were present in one or other of these cases. These may be considered under the following heads :—

- (i) *Skin.*—Rashes faded rapidly, the macular syphilides disappearing entirely, while the more severe papular and pustular eruption generally left some pigmentation.

Condylomata did especially well, generally becoming painless in twenty-four hours from injection, and thereafter rapidly shrinking and drying.

Ulceration of skin, either in the form of rupial eruption or as one or more ulcers, was present in fifteen cases [Nos. 5, 6, 9, 10, 13, 16, 33, 50, 66, 76, 84, 93, 126, 145, 148], most of which were of a “malignant” type. These ulcers without exception responded at once to the Salvarsan injection, and for the most part healed with marvellous rapidity (vide Table). This was the more remarkable, as in some cases the ulceration had developed despite and in the course of continuous vigorous mercurial treatment.

Onychia was noted in two cases [Nos. 9 and 25]. In the former of these [No. 9] there was suppuration under the nails of the R. Thumb, Index, and Middle fingers and of the L. Thumb, and all these were very tender. Twenty-four hours after an intravenous injection of .6 g. there was no tenderness, and the patient could without any pain drum on the table with these fingers. The suppurative process promptly ceased, and the pus dried up. Case 25 was less advanced, but here also the suppuration ceased in two days.

- (ii) *Mucous membrane* of mouth and fauces was affected in most cases, and in all degrees from the superficial "mucous patch" to the deep sloughing ulcers, of which Cases 2, 4, 10, 59, and 74 furnished the most striking examples. All these lesions, superficial and deep, responded readily to injection. As a rule, within twenty-four hours the mouth and throat ceased to be painful, and healing progressed rapidly.
- (iii) *Iritis* was present in five cases [Nos. 17, 58, 77, 99, and 124], and in all cleared up at once after injection. No. 58 cleared up so rapidly that he insisted on leaving the hospital seven days after his first and only injection. No. 77 similarly discharged himself three days after injection.

Retinitis causing impairment of vision was present in one case [No. 82]. After intravenous injection of .6 g. on 23rd May, R.V. improved from $\frac{6}{60}$ to $\frac{6}{9}$, but L.V. remained about $\frac{6}{60}$. A second injection of .6 g. on 14th June produced little, if any, further improvement up to the present. He has been able, however, to resume work as a navvy, having previously been quite incapacitated by impairment of vision.

- (iv) Headache, generally nocturnal, was a specially prominent symptom in six cases [Nos. 40, 74, 90, 99, 111, 127]. In all there was prompt relief within twenty-four hours after the first injection. One case [No. 127] had a slight return of the headache, which was effectually dispersed by the second injection. Especially striking was case 74, who, before injection, was suffering from intense nocturnal headache, described by him as "crushing in the top of his head." He could not get sleep at night, and wandered about the ward semi-delirious. Salvarsan .6 g. was given intravenously on 12th May at 3 p.m., and at 9 p.m. he was fast asleep, quite free of headache, which did not return, at any rate up to 25th May, when he absconded from the hospital.
- (v) Cerebral or spinal symptoms were noted in four Secondary cases [Nos. 17, 21, 142, 151]. Case 17 had been in a semi-demented condition for some months, and was transferred from another hospital as "Cerebral Syphilis." After one intravenous injection of .6 g. he made a steady recovery, and was discharged six weeks later vigorous in mind and body. Case 21, dull and lethargic before injection, described himself seven days later as feeling now "spry and active." Case 142 was admitted on 11th July, with complete right hemiplegia and aphasia, which

had begun forty-eight hours previously, and had developed progressively since then—presumably a case of arterial thrombosis in the L. side of the brain. He was at once given Salvarsan .3 g. intravenous, and this was repeated in seven days. Four days after the first injection he had regained power in the R. leg, and could speak intelligibly, and this improvement has continued until at the present time (10th August) he can stand with assistance, talk fairly clearly, and can move his R. arm and hand, though still clumsily. Case 151 developed complete paraplegia suddenly on 25th November, 1910, and has remained unimproved despite treatment. As there was a definite history of Syphilis, and his blood gave a slightly positive Wassermann reaction on 12th July, Salvarsan .3 g. was injected intravenously on 18th July. No improvement followed, the injection producing no apparent effect of any kind.

Tertiary Syphilis—forty-four cases.—The most prominent symptoms presented by these cases may be classified as follows:—

- (i) *Skin* ulceration—in sixteen cases. In all cases there was a prompt response to Salvarsan, with relief of pain, and in most instances healing progressed very rapidly. Case 8 may be referred to as one in which the first and second injections had little apparent effect on the extensive ulceration, whereas the third injection produced instant improvement. The ulcerative process was not, however, entirely checked, and I have within the last few weeks injected some dilute salvarsan solution locally around the ulcer, with definitely beneficial effect.
- (ii) *Mucous membrane* ulceration (Labial, Buccal, and Pharyngeal) in ten cases. These ulcers responded readily, and as a rule the patient was in twenty-four hours relieved of pain and salivation from which he had suffered for months past. Case 3 was an especially good example of this.
- (iii) *Glossitis and ulcers of the tongue* in five cases. All of these experienced great and rapid improvement. In Case 56 the lingual ulcer is still not entirely healed, although he has had altogether 1.8 g. of salvarsan by intra-muscular and intravenous injections. He feels very well, but has still a linear ulcer on the dorsum of the tongue, while the tongue itself has the typical appearance produced by chronic glossitis.
- (iv) *Ulcer of the bladder*—Case 133.—In this case the hæmaturia ceased, and the frequency of micturition became less, but he discharged himself before the cure was by any means complete.
- (v) *Stricture of rectum*.—Case 30 had had stricture of rectum seven years [colotomy five years ago], and had been treated by iodides without effect. No change was produced by Salvarsan.
- (vi) *Gumma of Testicle*—Case 24.—The first injection (subcutaneous) produced little or no effect. The second (intravenous), administered twelve weeks later, was followed in a few days by the breaking down of the gumma, discharge of contents, and rapid healing.

- (vii) *Bone lesions* were the prominent symptoms in three cases, Nos. 91, 104, and 132, and in all three the condition was probably ossifying periostitis. In Case 91 the bone affected was the Left humerus at its lower end; in Case 104 the Right femur [this case had elsewhere been diagnosed as an osteo sarcoma, and amputation had been urged on the patient]; and in Case 132 the lower end of R. humerus, and also the R. tibia. A common feature of all three cases was aching pain in the affected bones, worse at night. In all the nocturnal pain ceased after salvarsan injection, and in Case 104 the swelling of the femur became palpably less, with recovery of power in the limb. In the other two cases movement of the elbow became freer, but up to date of writing there has been little perceptible alteration in the bulk of the bone.
- (viii) *Vertigo and chronic headache* were prominent in five cases. In all cases there was relief of these symptoms.
- (ix) *Dementia*—Case 117.—Had been in a dull, stupid condition for two years. No improvement has so far followed salvarsan injection.

Congenital Syphilis—three cases, Nos. 36, 83, and 135.—Case 36, aged 15 years, with a very large deep ulcer on his left leg improved rapidly after 1 g. of Salvarsan given subcutaneously in doses of .2 g. in parolein, but the ulcer had not completely healed ten weeks later, when he was given a further dose, .3 g. intravenous. He improved greatly in general bodily health, and gained 12 lb. in seven weeks.

Case 83, aged 1½ years, with interstitial keratitis, has had .08 g. subcutaneously on 23rd May, and .12 g. intravenously on 12th July and 10th August. His bodily condition has improved greatly, and there appears to be definite improvement in vision, though the corneæ are not yet free from opacity.

Case 135, a girl of 18, with eczematous ulceration of left leg of five years' duration; cleared up rapidly after .3 g. intravenously.

Locomotor Ataxy—two cases, [Nos. 45 and 46].—In both there was temporary improvement of pains and of gastric symptoms, but after a few weeks a return to much the same condition as before. Case 46, however, felt some permanent improvement, and returned for a second injection some ten weeks after the first.

Spinal Myelitis, one case, No. 96.—This was a case of paraplegia, which was unaffected by Salvarsan.

Leprosy, one case, No. 106.—Non-leprotic iritis; there has been no apparent change in the leprosy symptoms from this single dose.

Anæmia, two cases, Nos. 108 and 162.—Of these, No. 108 was, I think, a case of secondary anæmia, and had already greatly improved on arsenic. After Salvarsan, his convalescence was more rapid. No. 162, a case of pernicious anæmia at an advanced stage, has shown no reaction to the small dose of Salvarsan injected on 27th July.

Sycosis Menti, one case, No. 98, which had obstinately resisted ordinary treatment.—The patient begged for Salvarsan, but there was little or no effect from two full doses.

Permanence of Results.—As the first injection of this series was made in February last, it is too early yet to say that any of these cases are abso-

lutely cured of the disease. With a view to getting information about such relapses as might occur, I have made a point of requesting all patients to keep me informed of their condition, after discharge, by periodically reporting themselves, and, in case any symptoms recurred, to at once come to see me. This they all readily undertook to do, but, as a rule, I have had no word of them after discharge, from which I think I may fairly conclude that they have remained well. The **only** instance of definite relapse after apparent cure was Case 4. He was given Salvarsan, .6 g., in suspension subcutaneously on 27th February, and discharged on 3rd March, with all lesions healed. On 18th May he returned, with a recurrence of the lingual ulcer, and a small sore near the anus. These rapidly healed after an intravenous injection of .6 g.

In no instance was the intravenous injection ineffectual, but there were instances of failure, complete or partial, of the subcutaneous and intramuscular injections. These may be briefly referred to here.

Case 7.—On 2nd March Salvarsan, .6 g., in suspension subcutaneously.—There was much local reaction at injection sites, cystic swellings being formed, which lasted more than two months. The tongue and throat became more ulcerated until intravenous injection of .6 g. on 9th April, when immediate improvement set in, and in ten days all ulceration was healed.

Case 10.—Malignant Secondary Syphilis rapidly cleared up after Salvarsan, .6 g., in suspension subcutaneously; but five weeks later there were signs of recurring inflammation in two places on sites of former ulcers. After intravenous injection of .6 g., these rapidly cleared up. Fifty-four days after the subcutaneous injection, one of the injection sites discharged semi-purulent yellowish material, presumably partly composed of Salvarsan which had been locked up there.

Case 31 had five subcutaneous injections of Salvarsan .2 g. in Parolein. rapid healing ensued in condylomata and ulcers of the mouth, but relapse occurred two months later. Complete and permanent healing after intravenous injection of .6 g.

Case 44 had three subcutaneous injections of .2 g. in Parolein. Ulcers of mouth and foot healed, but not that of tongue, until after an intravenous injection of .6 g.

Case 55 had three intragluteal injections of Salvarsan, .2 g.; four weeks later the ulcer on penis was worse than ever, and the rash was becoming rupial on the lower limbs. An intravenous injection of .6 g. caused rapid healing of all lesions.

Case 35 requires special mention, as being an instance either of relapse or of second infection. On 19th March Salvarsan .6 g. intravenous. Immediate healing of condylomata and of ulcers of mouth and left tonsil.

3rd April.—Discharged. Wassermann. +

14th July.—Returns with gonorrhœa, an indurated chancre of left side of prepuce which, he says, appeared on 28th June, seven days after exposure, and a suppurating bubo in R. groin.

31st July.—Wassermann. + +

The history of the present chancre suggests a fresh syphilitic infection, but the strongly positive Wassermann reaction so soon after the appearance of this chancre is against this.

Wasserman Reaction.—As previously stated, the Wassermann tests in connection with this series of cases were carried out by Dr. A. E. Finckh up to the end of May, and thereafter by the State Bureau of Microbiology. Blood from 137 of the cases was thus examined, but in 84 of these only a single test was made, and the results of these are, of course, of diagnostic value only. Of the others, 38 were tested twice, 9 three times, 4 four times, and 2 five times.

The results obtained are to be found in the tabulated description of the cases, but may be summarised briefly here:—

	Primary Syphilis.	Secondary Syphilis.	Tertiary Syphilis.
(i) Reaction became negative, or less positive than before.	.....	Case No. 2, 34, 48, 52, 55, 100, 122, 123, 139. 9 cases.	Case No. 27, 91, 130. 3 cases.
(ii) Reaction became positive, or more positive than before.	Case No. 105, 110. 2 cases.	Case No. 13, 35, 43, 54, 68, 82, 88, 120, 125, 145. 10 cases.	Case No. 3, 6, 8, 24, 42, 46 (Tabes), 102, 103, 121, 133. 10 cases.
(iii) Reaction remained unchanged.	Case No. 154 ... 1 case.	Case No. 11, 12, 32, 49, 64, 73, 74, 87, 138, 146, 163. 11 cases.	Case No. 41, 63, 75, 101, 128, 155. 6 cases.

Primâ facie, the most striking feature of these results is that in so large a proportion of cases the reaction remained unchanged, or became stronger after Salvarsan injection, although clinically the patients had improved. But an examination of the tabulated details of the individual cases will show that in many instances the successive observations were made with so short a time interval that no deductions could safely be drawn as to either the efficacy of the Salvarsan therapy or the reliability of the Wassermann reaction as an index of cure.

CONCLUSIONS.

It appears unnecessary to detail lengthy conclusions. The results of this series of cases, which are no better than those recorded elsewhere by the hundred, amply demonstrate that Salvarsan is a drug of wonderful efficacy in the treatment of Syphilis.

They also demonstrate that, with proper selection of cases and methods of administration, there is little danger connected with the use of the drug.

As to the permanence of the cure apparently wrought, one cannot yet decide, but in the meantime it is of immense importance, both to the individual and to the State, that we have now at our command a drug which can be relied on to render the most infectious case harmless in a few days—by rapidly healing the chancres, condylomata, and mucous membrane ulcers which undoubtedly play the chief part in spreading the disease, and it seems not extravagant to hope that, with the general adoption of this treatment, there will be a real diminution of the disease by the sterilizing of the sources of infection.

No.	Initials.	Sex.	Age.	Clinical Summary.	Salvarsan Injections.			
1	W.D.	M.	42	Secondary S. Rupial rash. Condylomata	25/2/11 .6 g. Suspension	.....	.....	.....
2	G.H. ...	M.	25	Secondary S. Extensive sloughing ulceration of Naso-pharynx, despite mercurial treatment since May, 1910.	25/2/11 .6 g. in Alkaline Solution.	9/4/11 .6 g.	.....	.....
3	T.V. ...	M.	40	Tertiary S. Severe ulceration of buccal mucous membrane, of tongue, hard palate and pharynx, despite continuous hospital treatment since May, 1908.	25/2/11 .6 g. i.v.	25/4/11 .6 g. i.v.	8/6/11 .6 g. i.v.	.....
4	W.C. ...	M.	28	Secondary S. Ulcerations of buccal mucous membrane, of tongue, of hard palate, and of both tonsils, despite continuous treatment since 27/1/11. Pil. Hutchinson 2 t.i.d. and Soamin injections, 100 grains in all.	27/2/11 .6 g. Suspension.	4/6/11 .6 g. i.v.	.....	.....
5	E.D. ...	M.	30	Secondary S. Ulcer at each angle of mouth, numerous ulcers of tongue, ulcers on both thighs.	27/2/11 .6 g. Alk. sol.	.....	.....	.....
6	J.R.V....	M.	35	Secondary S. of malignant type. Large painful ulcers over left Tendo Achillis, persisting since Nov., 1910. Has been under treatment in hospital since May, 1902. Cachexia.	27/2/11 .6 g. i.v.	6/6/11 .6 g. i.v.	16/6/11 .6 g. i.v.	.....
7	T.G. ...	M.	49	Secondary S. Glossitis and ulceration of left tonsil, getting worse despite mercurial treatment in hospital since 4/1/11.	2/3/11 .6 g. Suspension.	9/4/11 .6 g. i.v.	.....	.....
8	J.D. ...	M.	...	Tertiary S. Infected about June, 1909. Circumcised on 4/11/09. The wound sloughed, and ulceration slowly spread along penis to root, and then over pubic region to abdomen, leaving a track of scar tissue. This process has continued now for 2 years, despite mercury and iodide. Much pain in ulcerated surface.	2/3/11 .6 g. Alk. sol.	30/4/11 .6 g. i.v.	4/6/11 .6 g. i.v.	.....
9	T.M. ...	M.	24	Secondary S. Ulceration on both tonsils. laryngitis, rupial sores on forearms, left thigh and right sole, onychia of right thumb, index and middle fingers, and of left thumb. In hospital since 1/12/10. Above symptoms developed despite treatment with Pil. Hutchinson, 2 t.i.d. and Soamin injections, 100 gr. in all.	2/3/11 .6 g. i.v.	.....	.....	.....
10	J.M. ...	M.	32	Secondary S. of malignant type. In less than 8 weeks from primary chancre, and despite vigorous mercurial treatment had developed deep ulcers of head, trunk, and limbs, deep sloughing ulceration of both tonsils and arthritis of both wrists and right knee.	3/3/11 .6 g. Suspension.	9/4/11 .6 g. i.v.	.....	.....
11	A.D. ...	M.	27	Secondary S. Large chancre and papular rash.	5/3/11 .6 g. Suspension.	.....	.....	.....
12	J.K. ...	M.	20	Primary S. Chancre of prepuce ...	5/3/11 .6 g. Suspension.	.....	.....	.....
13	J.S. ...	M.	20	Secondary S. Sore throat and ulcer of right calf.	5/3/11 .6 g. Suspension.	7/5/11 .6 g. i.v.	.....	.....
14	H.C. ...	M.	37	Secondary S. Ulceration of both tonsils. Condylomata.	5/3/11 .6 g. Alk. Sol.	.....	.....	.....
15	L.D. ...	M.	20	Secondary S. Profuse macular rash, condylomata thickly clustered round anus.	5/3/11 .6 g. Alk. Sol.	.....	.....	.....
16	W.M. ...	M.	22	Secondary S. Rupial sores on trunk, left arm, and both legs, in size from three-pence to shilling, covered with greenish-brown scabs. Fresh sores developing, despite Pil. Hutchinson 2 t.i.d.	5/3/11 .6 g. Alk. Sol.	.....	.....	.....
17	R.C. ...	M.	47	Secondary S. Dementia, left Iritis and profound cachexia. Has had much malaria.	5/3/11 .6 g. i.v.	.....	.....	.....

Wassermann Reactions.				Weight gain.	General Result up to 10/8/11.
+	.....	.....	.....	.....	Discharged, 12/3/11. All symptoms entirely cleared up.
15/2/11	.....	.....	.....	.....
+	—	.....	.....	38 lb. in 14 weeks.	Immediate relief of pharyngeal symptoms. Convalescence prolonged by tedious separation of sequestra from nasa bones.
23/2/11	26/11	.....	.....	.....
+	+	++	++	19 lb. in 18 weeks.	Immediate relief of all oral and faucial symptoms. All ulceration healed within 2 weeks from first injection. Continuous gain in weight and vigour from the first.
11/4/11	5/6/11	17/7/11	9/8/11	.....
.....	—	.....	.....	4 lb. in 1 week after first injection.	All ulceration healed in 6 days. Three months later, on 18/5/11, returns with recurrence of lingual ulcer, which did not improve during 2 weeks' treatment with Pil. Hutchinson 2 t.i.d. After second injection of Salvarsan, tongue healed again in less than 7 days.
.....	5/6/11	.....	.....	.....
.....	.....	.....	.....	4 lb. 1 week ...	Ulcers of mouth and tongue healed completely, and ulcers of thighs almost healed in 2 weeks from injection, when he was discharged at his own request.
+	+	++	.....	11 lb. in 17 weeks.	In 2 days the ulcers were no longer painful, and healing proceeded uninterrupted, but was not completed until a second injection was given in June. The general condition and vigour improved rapidly from the first injection.
15/4/11	12/6/11	12/7/11	.....	.....
—	.....	.....	.....	8 lb. in 8 weeks following first injection.	The first injection (subcutaneous) had practically no effect on the lesions, which 4 weeks later were considerably worse—both tonsils ulcerated, 2 ulcers of hard palate. The injection sites had meanwhile remained swollen. After second injection (intravenous) immediate improvement set in, and all ulceration was healed in 10 days.
2/5/11	.....	.....	.....	.....
—	—	+ slight	+ slight	26/2/11, 129 lb.	The first and second injections had apparently no effect on the ulcerative process. Rapid improvement after third injection, and in 14 days most of the raw surface was skinned over. Then the healing came to a standstill. Local injection, on 23/7/11, round the ulcers of some dilute Salvarsan solution was followed by resumption of healing and at present date, 10/8/11, the ulcers are smaller than they have been for over 12 months.
23/2/11	18/4/11	19/6/11	17/7/11	23/3/11, 130 "	
.....	.....	.....	.....	23/4/11, 130 "	
.....	.....	.....	.....	21/5/11, 132 "	
.....	.....	.....	.....	25/6/11, 134 "	
.....	.....	.....	.....	23/7/11, 138 "	
.....	.....	.....	.....	1 lb. in 1 week...	In 24 hours after injection, all pain and tenderness were gone from the finger-nails. In 10 days all ulcers were entirely healed, except that on his thigh, which was almost so. 11 days after injection, he was, by his own request, discharged to resume work as an oiler.
.....	
—	.....	.....	.....	29 lb. in 9 weeks	In 48 hours from first injection, throat felt much easier, and all the ulcers were cleaner and healthier. In 3 weeks all ulcers were healed. 5 weeks after injection there were signs of renewed inflammation on the sites of two former ulcers on forehead and right cheek. This rapidly subsided after second injection. Rheumatic pains persisted in the hands after ulcers were healed, but ultimately cleared up under aspirin.
2/5/11	.....	.....	.....	.....
+	+	.....	.....	4 lb. in 2 weeks	During 24 hours following injection, the rash became more manifest, and there was tenderness and erythema of left calf and Tendo Achillis. This ceased next day. In 10 days all rash was gone and chancre healed.
22/2/11	16/3/11	.....	.....	.....
—	—	.....	.....	3 lb. in 2 weeks	Chancre healed rapidly. Discharged, 15/3/11.
16/2/11	14/3/11	.....	.....	.....
—	—	— ?	.....	35 lb. in 2 weeks	Sore throat cleared up rapidly, and ulcer healed to less than half the former size, but then remained stationary, despite second injection, and despite great improvement in general condition.
4/5/11	14/6/11	5/7/11	.....	.....
—	.....	.....	.....	1 lb. in 2 weeks	In 7 days all ulceration of throat was healed, and all condylomata dried up.
14/3/11	.....	.....	.....	.....
—	.....	.....	.....	3 lb. in 2 weeks	24 hours after injection, condylomata began to dry up, and in 7 days they had quite disappeared.
21/3/11	.....	.....	.....	.....
?	.....	.....	.....	3 lb. in 2 weeks	In 7 days all sores were healed; 11 days after injection, was discharged at his own request.
23/2/11	.....	.....	.....	.....
+	.....	.....	.....	No record ...	Within 24 hours of injection the eye felt better, and in a few days all symptoms of iritis had cleared up. His mental and bodily condition improved steadily, and in 6 weeks he was discharged well and vigorous.
23/2/11	.....	.....	.....	.....

No.	Initials.	Sex.	Age.	Clinical Summary.	Salvarsan Injections.			
18	RR.. ...	M.	30	Secondary S. Rash, ulcerated throat and condylomata. No improvement, despite Pil. Hutchinson, 2 t.i.d. since 8/1/11.	5/3/11 .6 g. i.v.	.....	.....	.....
19	W.M. ...	M.	31	Secondary S. Ulcer on tongue, mucous patches on soft palate, uvula, and both tonsils. No improvement on Pil. Hutchinson 2 t.i.d., and Pot. Iodid. gr. 10 t.i.d., since 13/2/11.	5/3/11 .6 g. i.v.	.....	.....	.....
20	A.B. ...	M.	23	Secondary S. Ulcer of tongue and of right tonsil, and macular rash, despite Pil. Hutchinson 2 t.i.d., since 25/1/11.	10/3/11 .6 g. Suspension.	.....	.....	.....
21	R.W. ...	M.	24	Secondary S. Feels dull and lethargic, hair is falling, teeth are tender, and he is salivated. Dermatitis of both shins On mercury since 12/1/11, without improvement.	10/3/11 .6 g. Alk. Sol.	.....	.....	.....
22	G.D. ...	M.	23	Secondary S. Under mercurial treatment as out-patient 10 months. Indefinite ill-health. No lesions visible.	10/3/11 .6 g. i.v.	.....	.....	.....
23	W.L. ...	M.	17	Secondary S. Macular rash, condylomata on perinæum and scrotum.	15/3/11 .6 g. Suspension.	.....	.....	.....
24	G.R. ...	M.	25	Tertiary S. Gumma of left testicle ...	15/3/11 .6 g. Suspension.	8/6/11 .6 g. i.v.	.....	.....
25	G.R. ...	M.	37	Secondary S. Maculopapular eruption on forehead, lower limbs, palms, and soles. Incipient onychia. Ulcer at each angle of mouth and on under surface of tongue. Has had mercurial treatment 2 months.	15/3/11 .6 g. Alk. Sol.	.....	.....	.....
26	G.S. ...	M.	27	Secondary S. Under treatment for 3 years continuously. For 2 years has had 2 small painful ulcers of tongue.	15/3/11 .6 g. Alk. Sol.	.....	.....	.....
27	T.N. ...	M.	41	Tertiary S. Ulceration and leucoplakia of buccal mucous membrane. Has persisted for 7 years despite mercury and iodide.	15/3/11 .6 g. i.v.	16/6/11 .6 g. i.v.	.....	.....
28	M.H.	F.	55	Tertiary S. Extensive condylomata of both Labia majora. Much scar tissue in same region. Chronic alcoholic.	16/3/11 .6 g. Alk. Sol.	.....	.....	.....
29	M.B. ...	F.	40	Tertiary S. Has had syphilis 17 years. Ulceration of naso-pharynx with ozæna for many years despite mercury and iodide.	16/3/11 .6 g. Alk. Sol.	.....	.....	.....
30	E.S. ...	F.	40	Tertiary S. Stricture of rectum 7 years ...	16/3/11 .6 g. Alk. Sol.	.....	.....	.....
31	J.K. ...	M.	20	Secondary S. Papular rash, condylomata, ulcers of lips and tonsils.	17/3/11-29/3/11 5 injections of .2 g. in Parolein.	28/5/11 .6 g. i.v.	.....	.....
32	J.M.B....	M.	73	Secondary S. Copious papular eruption ...	19/3/11 .6 g. Suspension.	.....	.....	.....
33	W.H. ...	M.	23	Secondary S. Numerous deep ulcers on trunk and limbs. Both tonsils ulcerated.	19/3/11 .6 g. Suspension.	.....	.....	.....
34	H.S. ...	M.	27	Secondary S. Infection in September, 1910. No previous treatment. Corymbose syphilide profuse on scalp, face, trunk, and limbs. Throat sore with mucous patches on tonsils.	19/3/11 .6 g. Alk. Sol.	6/6/11 .6 g. i.v.	.....	.....
35	S.M.R.	M.	30	Secondary S. Infected in Dec., 1910. Condyloma at anus. Ulcer of right angle of mouth and of left tonsil despite Pil. Hutchinson 6 per diem since 24/2/11.	19/3/11 .6 g. i.v.	4/8/11 .6 g. i.v.	.....	.....
36	T.C. ...	M.	15	Congenital S. Large deep painful ulcer of left leg.	19/3/11-29/3/11 5 injections .2 g. in Parolein.	6/6/11 3 g. i.v.	.....	.....

Wassermann Reactions.				Weight gain.	General Result up to 10/8/11.
.....	.....	.....	.....	No gain in 2 weeks.	All lesions healed rapidly, and he was discharged well 10 days after injection.
.....	.....	.....	.....	No gain in 1 week.	In 2 days from injection mucous patches had disappeared, and ulcer of tongue was almost healed. Eight days after injection he was discharged quite well, with no lesions remaining.
+ ? 24/4/11	.....	.....	.....	11 lb. in 7 weeks	Exacerbation of rash in 24 hours following injection. Rash then disappeared. Tonsil and tongue healed rapidly, but were still slightly tender when he was discharged on 24/4/11.
— 21/3/11	.....	.....	.....	No gain in 2 weeks.	Immediate improvement. In 2 days after injection teeth were no longer tender; salivation ceased. Hair ceased to fall out. Dermatitis rapidly cleared up. Expressed himself as feeling "spry and active." Discharged well 11 days after injection.
.....	.....	.....	.....	15 lb. in 4 weeks	General health and vigour improved rapidly. Discharged well 4 weeks after injection.
.....	.....	.....	.....	1 lb. in 3 weeks	24 hours after injection condylomata were smaller and no longer painful. In 2 weeks they were all dry, and on discharge, 3 weeks after injection, were represented by stains only.
— 2/6/11	+	.....	.....	12 lb. in 12 weeks.	First injection (subcutaneous) produced little or no effect on testicle. Second injection (intravenous), 12 weeks later, was followed in a few days by softening of the gumma, and 7 days after injection this discharged spontaneously, after which it healed rapidly. Discharged well 14 days after second injection.
.....	.....	.....	.....	No gain in 9 days.	All lesion subsided rapidly, pain gone in 24 hours. Onychia ceased in 2 days. Discharged well 9 days after injection.
.....	.....	.....	.....	No gain in 9 days.	Ulcers of tongue healed in less than 3 weeks, and tongue was still well when seen 3 months later.
+	+ slight	.....	.....	No gain ...	Ulcers of mucous membrane rapidly healed, and leucoplakia gradually cleared up.
16/6/11	17/7/11	.....	.....	.....	.....
+ ? 16/3/11	.....	.....	.....	4 lb. in 8 weeks	Condylomata healed rapidly. On 17/5/11—i.e., 9 weeks after injection—began to have diarrhoea with occasional vomiting. This persisted till death on 30/5/11. <i>Post-mortem</i> examination showed ulcerative colitis.
+	.....	.....	.....	Not recorded ...	Naso-pharynx improved rapidly and all visible ulceration healed, though some discharge persisted. Cystic swellings formed at injection sites, and on the right side broke through skin 8 weeks after injection.
16/3/11	.....	.....	.....	Not recorded ...	Stricture not affected.
+	.....	.....	.....	Not recorded ...	The Parolein injections produced immediate improvement in condylomata and ulcers, which completely healed. 8 weeks later he had relapsed and there was more ulceration than before in lips and fauces. This healed rapidly after the second (intravenous) injection.
24/4/11	.....	.....	.....	.....	.....
+	+	.....	.....	9 lb. in 4 weeks	Rash steadily faded.
20/3/11	15/5/11	.....	.....	.....	.....
— 21/3/11	.....	.....	.....	9 lb. in 9 days...	Patient absconded 16 days after injection. Ulcers were then nearly all healed, and the throat had been well for some days.
++	—	—	.....	6 lb. in 2 weeks after first in-	Throat cleared up rapidly. Rash faded steadily after first injection, but injection sites remained swollen and tender, and he complained of much muscular pain in back and right leg. Discharged on 24/4/11. Readmitted on 24/5/11, with same muscular pain and headache, which all ceased after second injection.
20/3/11	30/5/11	9/7/11	.....	.....	.....
+	++	.....	.....	3 lb. in 5 weeks	Condyloma and ulcers healed in about 7 days. Discharged, 3/4/11. Readmitted on 14/7/11, with gonorrhoea and a fresh chancre of prepuce, probably not syphilitic, which appeared on 28/6/11, 7 days after exposure to infection.
3/4/11	31/7/11	.....	.....	.....	.....
+	.....	.....	.....	12 lb. in 7 weeks	After the first Parolein injection the ulcer became painless, and healed, at first rapidly, later sluggishly. The intravenous injection on 6/6/11 further stimulated healing, but the ulcer was not entirely healed when he left the hospital on 15/6/11. Meanwhile, one of Parolein injection sites had broken down—on 12/6/11—and discharged semi-purulent fluid. This place was still unhealed, and presenting a slough on 12/7/11.
21/3/11	.....	.....	.....	.....	.....

No.	Initials.	Sex.	Age.	Clinical Summary.	Salvarsan Injections.			
37	E.W. ...	F.	20	Secondary S. Condylomata of labia majora and around anus.	21/3/11-29/3/11 4 injections .2 g. in Parolein.	6/6/11 .6 g. i.v.	.....	.....
38	R.B. ...	F.	21	Secondary S. Ulcer of mucous membrane of lower lip, and of tonsils.	23/3/11-29/3/11 3 injections .2 g. in Parolein.	.....	.....	.....
39	A.S. ...	M.	19	Secondary S. Infected Dec., 1910. Rash	25/3/11-29/3/11 2 injections .2 g. in Parolein.	.....	.....	.....
40	F.C. ...	M.	28	Secondary S. Infected Dec., 1910. Pus- tular rash on trunk and limbs. Ulcer of lower lip and of faucial arch. Nocturnal headache. Did not improve on mercury since 1/2/11.	25/3/11-27/3/11 2 injections .2 g. in Parolein.	.....	.....	.....
41	J.S. ...	M.	34	Tertiary S. 8-9 years since infection. Ulceration of both sides of glands and at root of penis.	25/3/11-29/3/11 3 injections .2 g. in Parolein.	.....	.....	.....
42	C.F.C....	M.	45	Tertiary S. 28 years since infection. Cachexia. Large foul ulcer on dorsum of penis.	25/3/11-29/3/11 3 injections .2 g. in Parolein.	16/6/11 .6 g. i.v.	.....	.....
43	H.H. ...	M.	23	Secondary S. Infected June, 1910. Rash papular. Ulcers of buccal mucous mem- brane and of right tonsil.	25/3/11-29/3/11 3 injections .2 g. in Parolein.	8/8/11 .6 g. iv.	.....	.....
44	G.S. ...	M.	40	Tertiary S. Infected 9 years ago. Had 3 years' mercurial treatment after infection, and for past 3 years Pot. Iodid. continu- ously. Ulcers of upper and lower lips. Chronic glossitis, with numerous ulcers. Pain in eating. Salivation. Ulceration of right ankle and foot.	25/3/11-29/3/11 3 injections .2 g. in Parolein	23/5/11 .6 g. i.v.	.....	.....
45	A.E.A.	M.	42	Locomotor ataxy 10 years; syphilis 16 years. Ataxy, loss of knee-jerks, girdle pains, and lightning pains. Sleeps very badly.	26/3/11 .3 g. i.v.	4/6/11 .6 g. i.v.	.....	.....
46	J.M. ...	M.	54	Locomotor ataxy; syphilis 30 years. Ataxy, loss of knee-jerks, gastric crises, lightning pains. Charcot's disease of Rt. knee.	26/3/11 .3 g. i.v.	14/7/11 .6 g. i.v.	.....	.....
47	T.C. ...	M.	19	Secondary S. Infected January, 1911. Hard chancere. Roseolar rash.	26/3/11 .6 g. i.v.	.....	.....	.....
48	A.M. ...	M.	26	Secondary S. Infected January, 1911. Rash copious, papular. Ulcers of both tonsils, laryngitis. Pain on swallowing.	26/3/11 .6 g. i.v.	.....	.....	.....
49	H.D. ...	M.	29	Secondary S. Infected December, 1910. Ulceration of lower lip, tongue, soft palate, and tonsils. Pain in swallowing.	26/3/11 .6 g. i.v.	30/6/11 .6 g. iv..	.....	.....
50	H.W. ...	M.	24	Secondary S. Infected November, 1910. Mercurial inunction since 19/1/11. In- dolent sore of lower lip, mucous patch of uvula, painful ulceration between toes of L. foot, which prevents him wearing a boot.	26/3/11 .6 g. i.v.	.....	.....	.....
51	R.B. ...	M.	22	Secondary S. Infected January, 1911. Ulcer of L. tonsil.	26/3/11 .6 g. i.v.	.....	.....	.....
52	J.G. ...	M.	19	Secondary S. Infected January, 1911. Rash copious, maculo-papular. Arth- ritis R. ankle.	2/4/11 .6 g. i.v.	.....	.....	.....
53	A.H. ...	M.	22	Primary S. Infected 12 weeks ago. 3 hard chancres on prepuce.	2/4/11 .6 g. i.v.	.....	.....	.....
54	A.M. ...	M.	51	Secondary S. Infected February, 1911. Chancre of prepuce and phimosis. Generalised macular papular rash. Cir- cumcised.	2/4/11 .6 g. i.v.	28/5/11 .6 g. i.v.	.....	.....

Wassermann Reactions.				Weight gain.	General Result up to 10/8/11.
.....	.....	.....	.....	.....	2 weeks after the first injection on 21/3/11, all the condylo- mata had disappeared and the labia were of normal size.
.....	.....	.....	.....	.....	10 days after the first injection all ulcers were healed.
+ ? 24/3/11	.....	.....	.....	No gain ...	Rash faded. Discharged, 5/4/11.
+ ? 24/3/11	.....	.....	.....	No gain ...	In less than 4 weeks all ulcers were healed, rash and headache gone.
+ 23/3/11	+ 11/4/11	.....	.....	1 lb. in 2 weeks	Discharge, 18/4/11, with ulcers almost healed.
+ 21/3/11	+— 11/4/11	++ 26/6/11	++ 26/7/11	28 lb. in 14 weeks.	Ulcer became cleaner and healthier after first injection, but was not completely healed till end of May. General con- dition improved wonderfully. Discharged 29/7/11, at his own request. Wassermann still ++.
+ 27/3/11	— 12/5/11	++ 2/8/11	.....	13 lb. in 7 weeks	Ulcers healed within 2 weeks of first injection.
+— 27/3/11	.....	.....	.....	7 lb. in 8 weeks	10 days after first injection mouth and foot were much im- proved, and he could eat with comfort. Tongue continued ulcerated, though painless. 2 days after the intravenous injection the lingual ulcer began to heal, and he was dis- charged at his own request on 26/5/11.
+ 21/3/11	.....	.....	.....	Not recorded ...	After first injection, said he felt much better; walking and sleeping were improved. Then relapsed. After second injection, had increased pains in legs. Discharged on 19/6/11, much the same as on admission.
+ 21/3/11	++ 17/7/11	.....	.....	Not recorded ...	For 3 weeks after first injection felt better, and did not vomit. Then relapsed, but general condition remained more vigorous than before.
+ 23/3/11	.....	.....	.....	No gain ...	For 6 days after injection had an irregular pyrexia up to 102° F. After this felt well. Rash faded rapidly. Chancre removed by circumcision.
+— 27/3/11	— 2/5/11	— 17/7/11	.....	11 lb. in 5 weeks	2 days after injection could swallow without pain, and voice was returning. 3 days later the tonsil ulcers were quite healed. 10 days later voice quite normal, and rash repre- sented by stains only. 4 months later still well.
— 23/3/11	— 30/3/11	.....	.....	.....	2 days after first injections ulcers of mouth, tongue, and throat had healed, and there was only slight tenderness of tip of tongue. Discharged, 31/3/11. Readmitted, 30/6/11, for small superficial sore of prepuce. Reinjected and discharged next day.
? 24/3/11	.....	.....	.....	5 lb. in 10 days	24 hours after infection could wear a boot on L. foot without pain. In a few days all ulcers were completely healed.
+ 23/3/11	.....	.....	.....	Not recorded ...	In 2 days after injection tonsil ulcer was healed. 5 days later he absconded.
+ 27/3/11	— 15/5/11	.....	.....	29 lb. in 5 weeks	For some hours after injection the rash was much more vivid. In 7 days his ankle was free of pain, and rash was much faded.
+ 3/4/11	.....	.....	.....	Not recorded ...	Chancres healed rapidly. Discharged on 15/4/11.
— 32/3/11	— 4/5/11	+slight 14/6/11	— 28/6/11	15 lb. in 12 weeks.	Rash quickly faded; 7 weeks after first injection developed diplopia due to paresis of L. external rectus, with some headache referred to R. side of vertex. Examined by Dr Gordon MacLeod (Hon. Consulting Oculist), who con- sidered this possibly syphilitic, and advised second in- jection. Second injection on 28/5/11, cleared up head- ache, but diplopia remained unchanged.

No.	Initials.	Sex.	Age.	Clinical Summary.	Salvarsan Injections.			
55	A.C. ...	M.	23	Secondary S. Infected February, 1911. Extensive ulcer of prepuce. Papular rash.	9/4/11-13/4/11 3 injections .2 g. intra-muscular.	26/5/11 .6 g. i.v.	.....	.....
56	W.D. ...	M.	35	Tertiary S. Infected 14 years ago. Has had extensive ulceration of pharynx. At present chronic glossitis and laryngitis. Has had active continuous treatment with mercury, iodides, and Soamin (1909).	9/4/11-13/4/11 3 injections .2 g. intra-muscular.	25/4/11 .6 g. i.v.	7/7/11 .6 g. i.v.	.....
57	O.L. ...	M.	29	Secondary S. Infected February, 1910. Ulcer of scrotum. Psoriasis of Rt. knee and L. instep. Mercurial treatment continuous since infection.	9/4/11-13/4/11 3 injections .2 g. intra-muscular.	.....	.....	.....
58	J.B. ...	M.	25	Secondary S. Infected December, 1910. L. iritis and ulceration of fauces for 5 weeks, getting worse under mercury.	12/4/11 .6 g. i.v.	.....	.....	.....
59	W.W....	M.	25	Secondary S. Infected February, 1911. Severe sloughing ulceration of nasopharynx. Rash.	12/4/11 .6 g. i.v.	.....	.....	.....
60	W.H. ...	M.	33	Tertiary S. Active ulceration of hard palate and of Rt. ankle.	23/4/11 .6 g. i.v.	.....	.....	.....
61	P.A.L.	M.	34	Secondary S. Infected in October, 1910. Ulceration of fauces. Condylomata. Slight albuminuria.	23/4/11 .6 g. i.v.	.....	.....	.....
62	P.T. ...	M.	33	Secondary S. Infected in December, 1910. Ulceration of lips and soft palate. Salivation. Sloughing ulcer of glands. Condylomata.	24/4/11 .6 g. i.v.	.....	.....	.....
63	J.B. ...	M.	43	Tertiary S. Infected 15 years ago. Chronic nasal discharge, pain—lachrymation in Rt. eye, R. frontal neuralgia.	26/4/11-28/4/11 2 injections .2 g. intra-muscular.	11/6/11 .6 g. i.v.	.....	.....
64	P.H. ...	M.	31	Secondary S. Infected June, 1910. Mucous patches in mouth.	26/4/11-28/4/11 2 injections .2 g. intra-muscular.	.....	.....	.....
65	W. ...	M.	67	Tertiary S. Infected in 1869. Vertigo, chronic headache, and pains in bones.	26/4/11-28/4/11 2 injections .2 g. intra-muscular.	.....	.....	.....
66	E.G. ...	M.	55	Secondary S. Infected about February, 1911. Primary chancre on Rt. index, condylomata, ulcer on R. leg.	30/4/11 .6 g. i.v.	.....	.....	.....
67	J.W. ...	M.	28	Secondary S. Infected about January, 1911. Chancre of umbilicus, condylomata, ulcers of mucous membrane of lower lip, and of fauces.	30/4/11 .6 g. i.v.	.....	.....	.....
68	J.S. ...	M.	35	Secondary S. Infected December, 1910. Condylomata, ulcer on R. leg, mucous patches of lips and tongue. Extensive superficial ulcer of L. tonsil.	3/5/11 .6 g. i.v.	6/6/11 .6 g. i.v.	.....	.....
69	R.T. ...	M.	27	Secondary S. Infected June, 1910. Condylomata, mucous patches on lips, laryngitis—aphonia.	3/5/11 .6 g. i.v.	28/5/11 .33 g. i.v.	6/6/11 .3 g. i.v.	.....
70*	C.M. ...	M.	25	Secondary S. Infected in November, 1910. General pustular eruption. Ulceration of tonsils.	6/5/11 .24 g. i.v.	.....	.....	.....
72	J.R. ...	M.	19	Secondary S. Infected March, 1911. Macular rash, phimosis, induration of prepuce.	7/5/11 .6 g. i.v.	6/6/11 .6 g. i.v.	.....	.....
73	W.B. ...	M.	25	Secondary S. Infected March, 1911. Chancre of prepuce, small ulcers on tongue, sore throat.	7/5/11 .6 g. neutral solution.	4/6/11 .6 g. i.v.	.....	.....
74	G.D. ...	M.	26	Secondary S. Infected April, 1911. Papular rash. Both tonsils deeply ulcerated and covered with grey slough. Great pain on swallowing. Intense nocturnal headache, causing semi-delirium and sleeplessness.	12/5/11 .6 g. i.v.	.....	.....	.....

* Through an oversight no case was numbered 71.

Wassermann Reactions.				Weight gain.	General Result up to 10/8/11.
+	?	.....	.....	10 lb. in 4 weeks	After intra-muscular injections, ulcer of prepuce healed and rash cleared up, but relapse occurred in 4 weeks, ulcer broke down, and rash reappeared as rupial sores on limbs. 10 days on Pil. Hutchinson 2 t.i.d., made no improvement, but after second (intravenous) injection ulcer at once began to heal and rash to disappear. Discharged by his own request 8 days after injection.
+	.....	.....	.....	3 lb. in 2 weeks	Intra-muscular injections produced only temporary improvement. Voice was more husky than ever 10 days later. Intravenous injection immediately improved tongue and voice, and he felt "better than for years past." 10 weeks later there was still a linear ulcer on dorsum of tongue, so another intravenous injection was given.
+	.....	.....	.....	.....	5 days after injection developed blotchy rash on face, trunk, and limbs, with temp. 102°, subsided in two days. Ulcer of scrotum rapidly healed, and psoriasis cleared up.
+	.....	.....	.....	No record ...	Exacerbation of rash 3 hours after injection. Eye and throat rapidly cleared up, and 7 days after injection he insisted on going home.
+—	.....	.....	.....	.....	Exacerbation of rash 3 hours after injection. In 7 days throat was quite healed.
+—	.....	.....	.....	.....	Ulcer of palate healed in 5 days, and of ankle in less than 2 weeks.
+—	.....	.....	.....	3 lb. in 2 weeks	Faucial ulcers and condylomata healed in 7 days from injection.
+	.....	.....	.....	6 lb. in 1 week...	Blotchy rash 2 hours after injection. Pain of throat ceased next day. 7 days after injection ulcers of mouth and of glands were healed.
—	—	.....	.....	5 lb. in 10 weeks	Intra-muscular (gluteal) injections partially relieved head ache and nasal symptoms, but caused much sciatic pain. Intravenous injection removed all headache. General condition much improved.
—	—	.....	.....	5 lb. in 10 weeks	Injections caused much pain down sciatic nerve, but rapidly improved the mouth.
.....	.....	.....	.....	.....	The intra-muscular injections caused sciatic pain, intense for 2 weeks, and in a modified degree lasting several weeks more. The vertigo and other symptoms were greatly relieved.
?	.....	.....	.....	11 lb. in 3 weeks	24 hours after injection the digital chancre was no longer painful. Condylomata dried up rapidly. In 4 weeks finger was quite, leg almost, healed.
+	.....	.....	.....	7 lb. in 2 weeks	Rapid healing of all lesions complete in 12 days from injection.
—	+ sl.	.....	.....	5 lb. in 4 weeks	24 hours after first injection pain of throat was relieved. All lesions rapidly healed. Re-examined and found well on 26/7/11.
—	.....	.....	.....	4 lb. in 4 weeks	After first injection throat became less sore, but voice remained hoarse. Later voice became worse, and he developed nocturnal headaches. The subsequent injections relieved all symptoms.
—	.....	.....	.....	2 lb. in 9 days...	Though the dose was small (through an accident in administration), the improvement of all symptoms was rapid, and he was discharged well 15 days after injection.
+	.....	.....	.....	8 lb. in 4 weeks	Rash disappeared, and swelling of prepuce was much diminished, but phimosis was not relieved.
—	—	.....	.....	4 lb. in 4 weeks	Throat began to improve at once after first injection, but tongue ulcers hung fire till after second, when they cleared up rapidly.
+	+	.....	.....	2 lb. in 1 week...	Injection caused rigor, 103° F., and vomiting. 6 hours after injection was free of headache and slept soundly each night afterwards. Throat painless and visibly cleaner in 24 hours from injections, and healed in 13 days, when he absconded from hospital.

No.	Initials.	Sex.	Age.	Clinical Summary.	Salvarsan Injections.			
75	J.C.F. ...	M.	33	Tertiary S. Multiple deep ulcers of L. buttock and leg, causing much pain. Treated here as tuberculosis for 2 months without improvement.	12/5/11 .6 g. i.v.	.....	.....	.....
76	E.N. ...	M.	37	Secondary S. Multiple deep painful ulcers of lower limbs, of 4 weeks duration, and getting worse, despite mercury.	19/5/11 .6 g. i.v.	.....	.....	.....
77	W.T. ...	M.	23	Secondary S. Infected January, 1911. Under mercurial treatment for past 2 months. L. iritis well marked, also deep ulcer on dorsum of R. foot.	19/5/11 .6 g. i.v.	.....	.....	.....
78	N.C. ...	F.	18	Secondary S. Ulcers on lips and tongue, and L. tonsil, which have developed despite Pil. Hutchinson for past 3 months.	22/5/11 .3 g. i.v.	7/7/11 .6 g. i.v.	.....	.....
79	D.G.	F.	40	Secondary S. Infected about January, 1911. Rash. Ulcer in mouth.	22/5/11 .3 g. i.v.	6/6/11 .6 g. i.v.	.....	.....
80	S.I. ...	F.	18	Secondary S. Condylomata of labia, which were not healed by Pil. Hutchinson, 2 t.i.d. for 4 months.	22/5/11 .3 g. i.v.	7/7/11 .6 g. i.v.	.....	.....
81	G.S. ...	F.	21	Secondary S. Papular rash and ulceration of fauces, developed despite 4 months' treatment with Pil. Hutchinson, 6 per diem.	22/5/11 .3 g. i.v.	6/6/11 .6 g. i.v.	.....	.....
82	J.McG.	M.	50	Secondary S. Infected 1 year ago. Condyloma. Small ulcers of mouth. Impairment of vision (? Retinitis).	23/5/11 .6 g. i.v.	14/6/11 .6 g. i.v.	8/8/11 .3 g. i.v.	.....
83	O.M. ...	M.	1½	Congenital S. Interstitial keratitis ...	23/5/11 .08 g. sub-cut.	12/7/11 .12 g. i.v.	10/8/11 12 g. i.v.	.....
84	A.F. ...	M.	28	Secondary S. Infected December, 1910. Large rupial sores of scalp and face.	26/5/11 .6 g. i.v.	6/6/11 .6 g. i.v.	.....	.....
85	E.M. ...	M.	22	Secondary S. Infected February, 1911. Ulceration of tonsils.	28/5/11 .6 g. i.v.	8/6/11 .6 g. i.v.	.....	.....
86	A.R. ...	M.	23	Secondary S. Infected April, 1911. Chancre, papular rash, ulcers of fauces.	28/5/11 .6 g. i.v.	8/6/11 .6 g. i.v.	.....	.....
87	G.B. ...	M.	26	Secondary S. Infected March, 1911. Papular rash.	1/6/11 .6 g. i.v.	14/6/11 .6 g. i.v.	.....	.....
88	D.R. ...	M.	19	Secondary S. Infected February, 1911. Profuse maculo papular rash.	1/6/11 .6 g. i.v.	11/6/11 .6 g. i.v.	.....	.....
89	W.W. ...	M.	42	Secondary S. Infected January, 1910. Eczema of groin and scrotum.	1/6/11 .6 g. i.v.	11/6/11 .6 g. i.v.	.....	.....
90	E.W. ...	M.	40	Secondary S. Infected March, 1911. Phimosis, chancre of prepuce. Severe nocturnal headache.	1/6/11 .6 g. i.v.	8/6/11 .6 g. i.v.	.....	.....
91	J.C. ...	M.	34	Tertiary S. Infected 1901. Ossifying periostitis of lower end of the L. humerus, rendering limb useless. Tenderness, limitation of movement, nocturnal pain	2/6/11 .6 g. i.v.	14/6/11 .6 g. i.v.	.....	.....
92	A.H. ...	M.	27	Secondary S. Infected January, 1911. Ulcer of fauces.	2/6/11 .6 g. i.v.	14/6/11 .6 g. i.v.	.....	.....
93	R.F. ...	M.	33	Secondary S. Infected February, 1911. Ulceration and fissuring of tongue, ulcers on back.	2/6/11 .6 g. i.v.	11/6/11 .6 g. i.v.	.....	.....
94	W.S. ...	M.	20	Secondary S. Infected November, 1910. Ulcer at R. angle of mouth and on dorsum of tongue, despite 4 months continuous mercurial inunction.	2/6/11 .6 g. i.v.	11/6/11 .6 g. i.v.	.....	.....
95	W.J.S.	M.	50	Tertiary S. Many deep ulcers on both legs, cachectic, no albuminuria.	2/6/11 .6 g. i.v.	14/6/11 .6 g. i.v.	.....	.....

Wassermann Reactions.				Weight gain.	General Result up to 10/8/11.
—	—	.....	.....	.....	2 days after injection ulcers were free of pain, and looking healthier. 9 days after injection he was discharged at his own request, the ulcers having healed to a great extent. 3 weeks later the ulcers on buttock had all healed.
23/3/11	2/5/11	.....	.....	.....
+	.....	.....	.....	.....	Discharged 7 days after injection by his own request; ulcers all nearly healed.
15/5/11	.....	.....	.....	.....
—	.....	.....	.....	.....	Iritis cleared up so rapidly that he insisted (against advice) on leaving hospital 3 days after injection.
19/5/11	.....	.....	.....	.....
.....	.....	.....	.....	.....	3 days after first injection the ulcers were almost healed.
.....	.....	.....	.....	.....	3 days after second injection ulcer was healed, and rash almost entirely gone.
.....	.....	.....	.....	10 lb. in 6 weeks	All lesions healed rapidly.
.....	.....	.....	.....	.....	8 days after first injection the ulceration of fauces and palate was healed, and all lesions were gone by 9/6/11.
+-	+	.....	.....	.....	Condyloma and ulcers of mouth healed rapidly. R.V. rapidly improved from $\frac{5}{6}$ to $\frac{5}{8}$, and remained good. L.V. did not improve up to date of discharge (8/7/11). Re-examined, 8/8/11, remains about the same.
12/5/11	14/6/11	.....	.....	.....	Cornea remains somewhat hazy, but appears less so than before injection. General condition of child is much brighter.
—	.....	.....	.....	.....	Discharged by his own request 15 days after first injection. Most of sores quite healed, others nearly so.
17/7/11	.....	.....	.....	.....
+	.....	.....	.....	.....	12 days after first injection was discharged with all lesions completely healed.
29/5/11	.....	.....	.....	.....
+	.....	.....	.....	.....	do do
9/5/11	.....	.....	.....	.....
+	+	.....	.....	.....	5 lb. in 2 weeks
29/5/11	5/6/11	.....	.....	.....
+	+	.....	.....	.....	Rash cleared up rapidly. Discharged 18 days after first injection.
19/5/11	12/6/11	.....	.....	.....
—	?	+ slight	.....	4 lb. in 1 week...	12 days after first injection discharged with rash almost gone. 2/8/11 re-examined. Occasional frontal headache, other wise well.
30/5/11	28/6/11	9/7/11	.....	.....	Improvement of eczema within 24 hours of first injection. Discharged 14/6/11.
—	.....	.....	.....	2 lb. in 1 week...	
19/5/11	.....	.....	.....	.....	4 days after first injection was free of headache and could retract prepuce. Discharged well on 9/6/11.
+	
29/5/11	.....	.....	.....	.....
++	++	+	.....	9 lb. in 9 weeks	After both injections exacerbations of periostitic pain. 7 days after first injection there was definitely less pain and better movement of the arm. The arm improved so that he was able to work with the painter; the swelling remained about the same up to 8/8/11, when he was discharged by his own request.
2/6/11	26/6/11	24/7/11	.....	.....	Faucial ulcer healed 7 days from first injection.
—	
30/5/11	.....	.....	.....	.....	24 hours after first injection tongue ceased to be painful. On discharge 13 days after first injection all ulcers were healed.
++	.....	.....	.....	2 lb. in 1 week...	7 days after first injection ulcer at angle of mouth was healed. On 13/6/11, discharged with all lesions healed.
2/6/11	.....	.....	.....	.....
—	
30/5/11	.....	.....	.....	.....
+	.....	.....	.....	2 lb. in 2 weeks	3 days after first injection ulcers were healing well, and 9 days after second injection they were well healed. 13 days after second injection had a kind of fit, became semi-comatose, and remained so till death on 3/7/11. <i>Post-mortem</i> showed chronic pachy- and lepto-meningitis; liver, spleen, and kidneys contained only traces of arsenic.
16/5/11	.....	.....	.....	.....

No.	Initials.	Sex.	Age.	Clinical Summary.	Salvarsan Injections.			
96	R.C. ...	M.	39	Myelitis. ? of syphilitic origin. Paraplegia 11 weeks, extensive bed-sores.	4/6/11 ·6 g. i.v.	.....	.....	.....
97	J.K. ...	M.	43	Tertiary S. Vertigo and headaches for many months.	4/6/11 ·6 g. i.v.	.....	.....	.....
98	J.T.S. ...	M.	31	Syccosis Menti. Unimproved by ordinary treatment. No definite history of S.	4/6/11 ·6 g. i.v.	14/6/11 ·6 g. i.v.	.....	.....
99	J.W. ...	M.	47	Secondary S. Chancre on right thumb. L. iritis with intense headache. Papular rash.	4/6/11 ·6 g. i.v.	11/6/11 ·6 g. i.v.	.....	.....
100	J.S. ...	M.	25	Secondary S. Infected March, 1911. Ulceration of lips, tongue, and both tonsils developed during 7 weeks' treatment with Pil Hutchinson, 6 per diem.	4/6/11 ·6 g. i.v.	11/6/11 ·6 g. i.v.	.....	.....
101	L.D. ...	M.	27	Tertiary S. Infected 3 years ago. Multiple small ulcers of L. instep and R. ankle.	8/6/11 ·6 g. i.v.	16/6/11 ·6 g. i.v.	.....	.....
102	H.S. ...	M.	28	Tertiary S. Infected 3 years ago. Ulcer on lower lip. Mercurial treatment 2½ years.	8/6/11 ·6 g. i.v.	16/6/11 ·6 g. i.v.	.....	.....
103	M.V. ...	M.	30	Tertiary S. Infected in 1908. Treated then (in Germany) with 19 injections of Hg., and since then with pills for recurring sores. 2 ulcers on Scrotum, 1 on L. thigh, ulceration over R. Tendo Achilles, and at base of R. second toe. Some pain on swallowing. 2 small "papules" at base of uvula.	8/6/11 ·6 g. i.v.	20/6/11 ·6 g. i.v.	.....	.....
104	A.S. ...	M.	33	Tertiary S. (?) Gumma of R. Femur. Sent from Queensland as Sarcoma. Pain and swelling, 7-8 months.	11/6/11 ·6 g. i.v.	4/7/11 ·6 g. i.v.	.....	.....
105	G.S. ...	M.	32	Primary S. Chancre on 12th May, 1911. Preputial chancre, painful.	14/6/11 ·6 g. i.v.	7/7/11 ·6 g. i.v.	.....	.....
106	J.C. ...	M.	48	Leprosy + Syphilis. (?) No definite history of Syphilis; but has in the past had double iritis, and suffers from chronic headache.	14/6/11 ·6 g. i.v.	10/8/11 ·6 g. i.v.	.....	.....
107	A.G. ...	F.	42	Tertiary S. Infection about June, 1909. Chronic headache + hypochondriasis.	15/6/11 ·6 g. i.v.	.....	.....	.....
108	C.D. ...	M.	64	Anæmia of 5 years duration. (?) "pernicious."	16/6/11 ·6 g. i.v.	.....	.....	.....
109	O.W. ...	M.	31	Secondary S. Infected about April, 1911. Profuse papular rash. 4 indurated ulcers on penis. Ulcers of tongue and soft palate.	16/6/11 ·6 g. i.v.	.....	.....	.....
110	J.C. ...	M.	24	Primary S. Chancre 9 days ago ...	20/6/11 ·6 g. i.v.	4/7/11 ·6 g. i.v.	.....	.....
111	M.C. ...	M.	22	Secondary S. Infected April, 1911. Preputial chancre and maculo-papular rash. Headache.	20/6/11 ·6 g. i.v.	4/7/11 ·6 g. i.v.	.....	.....
112	A.G. ...	M.	37	Secondary S. Infected 2½ years ago. Extensive superficial ulceration of fauces. Eczema of palms and soles.	20/6/11 ·6 g. i.v.	4/7/11 ·6 g. i.v.	.....	.....
113	F.M. ...	M.	30	Secondary S. Infected about January, 1911. Mucous patch on fauces.	20/6/11 ·6 g. i.v.	.....	.....	.....
114	W.R. ...	M.	44	Tertiary S. Infected 8 years ago. Severe headaches, weariness, pains down shins.	20/6/11 ·6 g. i.v.	4/7/11 ·6 g. i.v.	.....	.....
115	S.S. ...	M.	40	Tertiary S. Infected 14 years ago. Many scars of former ulcers. No present active symptoms.	20/6/11 ·6 g. i.v.	.....	.....	.....

Wassermann Reactions.				Weight gain.	General Result up to 10/8/11.
.....	.....	.....	.....	.....	No improvement in paraplegia. Bed-sores became worse and he died on 16/7/11, 6 weeks after injection.
.....	.....	.....	.....	.....	Discharged 4 days after injection. Said he felt much better.
— 29/5/11	.....	.....	.....	.....	Discharged, 17/6/11. Condition improved, but not cured yet.
+— 29/5/11	.....	.....	.....	.....	First injection caused much vomiting, but headache was at once relieved. Iritis rapidly improved. Discharged on 13/6/11 with chancre healed, eye perfectly well, and no headache.
? 5/5/11	++ 12/6/11	+sl. 5/7/11	+sl. 12/7/11	7 lb. in 3 weeks.	Lesions began to heal immediately after first injection and were all healed by 18/6/11.
+ 5/6/11	+ 12/6/11	.....	.....	5 lb. in 2 weeks.	All ulcers healed rapidly, and he was discharged on 26/6/11.
+— 29/5/11	++ 12/6/11	.....	.....	3 lb. in 10 days.	Ulcer on lip quite healed 7 days after first injection. Discharged on 19/6/11.
— 7/6/11	+sl. 14/6/11	— 12/7/11	.....	2 lb. in 5 weeks.	10 days after first injection all ulcers were quite healed, but soreness of throat remained and was not affected by second injection. Appearance of uvula remained the same. General health very good, working hard as carpenter during whole time in hospital. Discharged, 23/7/11.
— 7/6/11	.....	.....	.....	11 lb. in 4 weeks.	Discharged, 10/7/11; free of pain in thigh, able to use it more freely and strongly, and with considerable diminution of the swelling.
— 5/6/11	+sl. 19/6/11	.....	.....	4 lb. in 4 weeks.	Chancre, painless 2 days after first injection; perfectly healed 25 days after first injection. Discharged, 23/7/11.
.....	.....	.....	.....	.....	Headaches decidedly less since first injection, Leprous manifestations appear unaffected.
.....	.....	.....	.....	.....	Much vomiting for 48 hours. Headache ceased, with improvement of general health.
.....	.....	.....	.....	.....	He had improved on Liq. Arsenicalis, but with the omission of this and injection of Salvarsan, improvement became rapid, and he was discharged well on 1/7/11.
+— 28/6/11	.....	.....	.....	2 lb. in 1 week.	2 days after injection no soreness of tongue or mouth; rash clearing, ulcers on penis healing. Discharged at his own request on 30/6/11.
— 21/6/11	+slight 26/6/11	.....	.....	1 lb. in 1 week.	Chancre completely healed in 9 days from first injection Discharged, 7/7/11.
+ 19/6/11	.....	.....	.....	3 lb. in 1 week.	For some days after first injection rash was much more intense. On discharge, 6/7/11, chancre healed, rash faded; all subjective symptoms gone.
+ 14/6/11	.....	.....	.....	.....	After first injection, a gland in R. groin, the site of a former swelling, swelled and was painful for a few hours. 3 days after first injection throat was quite healed, and he was discharged well on 6/7/11.
— 7/6/11	.....	.....	.....	.....	Throat rapidly cleared up after injection.
+ 14/6/11	.....	.....	.....	3 lb. in 1 week.	3 days after first injection headache had quite gone. Discharged, 6/7/11. Feeling well and vigorous.
— 12/6/11	.....	.....	.....	.....	Discharged, 21/6/11.

No.	Initials.	Sex.	Age.	Clinical Summary.	Salvarsan Injections.			
116	P.S. ...	M.	25	Secondary S. Infected 1908. Small ulcer of tongue tip and of buccal mucous membrane, despite mercurial treatment for past 12 months.	20/6/11 .6 g. i.v.	30/6/11 .6 g. i.v.	.....	.....
117	J.C. ...	M.	33	Tertiary S. Infected 1907. Partial dementia. Has done no work for 2 years.	21/6/11 .6 g. i.v.	14/7/11 .6 g. i.v.	.....	.....
118	E.H. ...	M.	28	Secondary S. Infected December, 1910. Ulceration of uvula and post. pharyngeal wall. Painful ulcer near anus.	21/6/11 .6 g. i.v.	.....	.....	.....
119	H.McC.	M.	20	Secondary S. Infected April, 1911. No active signs.	21/6/11 .6 g. i.v.	.....	.....	.....
120	G.W.P...	M.	23	Secondary S. Infected January, 1911. Sore throat. General corymbose rash.	21/6/11 .6 g. i.v.	4/7/11 .6 g. i.v.	.....	.....
121	W.C. ...	M.	29	Tertiary S. Infected 1902. Headache almost constant. Uvula swollen, and bears some small papules. Swallowing painful, even of fluids.	30/6/11 .6 g. i.v.	14/7/11 .6 g. i.v.	.....	.....
122	J.J. ...	M.	50	Secondary S. Infected about April, 1911. Papular rash. Condylomata.	30/6/11 .6 g. i.v.	14/7/11 .6 g. i.v.	.....	.....
123	C.L. ...	M.	24	Secondary S. Infected April, 1911. Maculo papular rash. Mucous patches of both tonsils.	30/6/11 .6 g. i.v.	14/7/11 .6 g. i.v.	.....	.....
124	A.P. ...	M.	43	Secondary S. Infected March, 1911. L. iritis 7 days. Mucous patches on lips, uvula, and L. tonsil.	30/6/11 .6 g. i.v.	14/7/11 .6 g. i.v.	.....	.....
125	A.S. ...	M.	37	Secondary S. Infected December, 1910. Upper incisors loose and painful, alveolus partially necrosed.	30/6/11 .6 g. i.v.	21/7/11 .6 g. i.v.	.....	.....
126	W. ...	M.	27	Secondary S. Infected August, 1910. Rupial sores of scalp.	30/6/11 .6 g. i.v.	.....	.....	.....
127	J.McG.	M.	23	Secondary S. Infected May, 1911. Large ulcer of penis. Lenticular rash generalised. Nocturnal headache.	4/7/11 .6 g. i.v.	14/7/11 .6 g. i.v.	.....	.....
128	J.M. ...	M.	36	Tertiary S. Infected 4 years ago. Headache, ulcer of hard palate, epistaxis.	4/7/11 .6 g. i.v.	18/7/11 .6 g. i.v.	.....	.....
129	H.B. ...	M.	31	Secondary S. Infected June, 1910. Bul- lous eruption on backs of both hands. Ulceration of left tonsil and of pharynx.	7/7/11 .6 g. i.v.	.....	.....	.....
130	D.D ...	M.	56	Tertiary S. Infected 13 years ago. For 10 weeks has had ulceration of whole back of left wrist and hand, and an indolent ulcer 1½ inch x 1¼ inch on right leg.	7/7/11 .6 g. i.v.	21/7/11 .6 g. i.v.	.....	.....
131	J.N. ...	M.	45	Secondary S. Infected June, 1911. Several small ulcers of glans penis. Copious papular rash. Indurated painful inguinal glands.	7/7/11 .6 g. i.v.	18/7/11 .6 g. i.v.	.....	.....
132	C.T. ...	M.	31	Tertiary S. Infected 14 years ago. Ulcers over scalp. Chronic ossifying periostitis of lower end of right humerus, and of right tibia. Right arm almost useless. Bones very painful at night. Pot. iodide 75 grains per diem for two years.	7/7/11 .6 g. i.v.	14/7/11 .6 g. i.v.	.....	.....
133	W.W....	M.	33	Tertiary S. Infected, 1904. Frequency of micturition hourly, day and night, and hæmaturia. Syphilitic ulcer of bladder.	7/7/11 .3 g. i.v.	18/7/11 .3 g. i.v.	.....	.....
134	A.P. ...	M.	36	Tertiary S. Infected 1906. Leucoplakia of buccal mucous membrane.	7/7/11 .6 g. i. v.	18/7/11 .6 g. i.v.	.....	.....

Wassermann Reactions.				Weight gain.	General Result up to 10/8/11.
+	.....	.....	.....	.....	3 days after first injection ulcers were healed. Discharged, 1/7/11.
14/6/11	.....	.....	.....	.....
+sl.	.....	.....	.....	3 lb. in 2 weeks.	Discharged, 17/7/11. Perhaps slightly brighter and less sluggish.
10/7/11	.....	.....	.....	.....
++	.....	.....	.....	4 lb. in 3 weeks.	8 days after injection throat ulcers were quite healed, and anal ulcer scabbed over; 6 days later latter quite healed.
26/6/11	.....	.....	.....	.....	Discharged, 22/6/11.
.....	
+	++	.....	.....	1 lb. in 1 week.	3 days after first injection throat ceased to be sore. Discharged, 10/7/11, with rash almost gone, and feeling very well.
26/6/11	10/7/11	.....	.....	.....
(?)	++	.....	.....	4 lb. in 1 week.	9 days after first injection all headache gone and throat quite well.
28/6/11	5/7/11	.....	.....	.....
++	—	.....	.....	8 lb. in 3 weeks.	Rash and condylomata rapidly disappeared.
5/7/11	2/8/11	.....	.....	.....
++	+sl.	.....	.....	15 lb. in 4 weeks	Rash and mucous patches rapidly cleared up.
3/7/11	2/8/11	.....	.....	.....
++	.....	.....	.....	4 lb. in 3 weeks.	24 hours after first injection eye had much improved. 5 days later there was no trace of iritis, and throat was well. 7 days after injection developed temperature 102°, purpuric eruption of lower limbs, and arthritis of ankles and wrists. In bed three days, then felt well. 6 hours after second injection recrudescence of pain in joints generally. Next day erythema of ankles, legs, and inner surface of thighs, which lasted 2 days. Discharged on 26/7/11, feeling very well.
3/7/11	.....	.....	.....	.....
—	+slight	.....	.....	4 lb. in 4 weeks.	Discharged 24/7/11. After removal of necrosed alveolus and two loose incisors, remaining teeth became firm and comfortable.
26/6/11	17/7/11	.....	.....	.....
+	.....	.....	.....	.....	Discharged by his own request on 9/7/11. Scalp very much improved.
3/7/11	.....	.....	.....	.....
++	.....	.....	.....	.....	After first injection ulcer cleaned up and began to heal, but headache remained until second injection, when it ceased completely. Discharged on 21/7/11, with penile ulcer almost healed.
3/7/11	.....	.....	.....	.....
++	++	.....	.....	4 lb. in 4 weeks.	Discharged, 7/8/11. Ulcer of hard palate has healed and epistaxis has ceased, but he still has an offensive nasal discharge.
5/7/11	31/7/11	.....	.....	.....
++	.....	.....	.....	.....	2 days after injection hands had healed and no ulceration was visible in the throat. Temperature irregularly raised for 10 days after injection. Discharged, 7/17/11.
5/7/11	.....	.....	.....	.....
+	+slight	.....	.....	.....	31 days after first injection he was discharged, with hands completely healed, and leg ulcer rather smaller than a three-penny piece.
10/7/11	2/8/11	.....	.....	.....
++	.....	.....	.....	2 lb. in 1 week.	2 days after first injection inguinal glands were no longer tender. 7 days later all sores were healed, and rash fading. Discharged, 17/7/11.
10/7/11	.....	.....	.....	.....
++	.....	.....	.....	6 lb. in 4 weeks.	After both injections, but especially after second, there was exacerbation of pain in right frontal region, right humerus and right tibia. Nocturnal pain then ceased, but enlargement of bone remains. Head ulcers have quite healed.
10/7/11	.....	.....	.....	.....
—	+slight	+slight	++	.....	2 days after injection held his urine from 6 a.m. to noon. Subsequently 2-hourly micturition with less blood than before. Discharged, 31/7/11, by his own request, feeling very much better.
15/5/11	26/6/11	17/7/11	31/7/11	.....
.....	.....	.....	.....	.....	Discharged immediately after injection. No alteration.

No.	Initials.	Sex.	Age.	Clinical Summary.	Salvarsan Injections.			
135	F.B. ...	F.	18	Congenital S. Eczematous ulceration of left leg, of 5 years' duration.	7/7/11 .3 g. i.v.	.....	.....	.....
136	M.D. ...	F.	22	Secondary S. Infected about March, 1911. Copious maculopapular rash. Condylomata of labia. Ulcer of right tonsil.	7/7/11 .6 g. i.v.	18/7/11 .6 g. i.v.	.....	.....
137	R.P. ...	F.	39	Primary S. Infected June, 1911. Chancre of meatus urinarius.	10/7/11 .6 g. i.v.	18/7/11 .6 g. i.v.	.....	.....
138	W.H. ...	M.	35	Secondary S. Infected April, 1911. Phimos. Condylomata of scrotum and thighs. Mucous patch of soft palate and uvula.	10/7/11 .6 g. i.v.	21/7/11 .6 g. i.v.	.....	.....
139	J.B. ...	M.	23	Secondary S. Infected May, 1911. Papular rash.	11/7/11 .6 g. i.v.	21/7/11 .6 g. i.v.	.....	.....
140	J.R. ...	M.	38	Tertiary S. Infected 6 years ago. Sore throat for 2 years, getting worse, despite almost continuous Hg. and Iodide. Active ulceration of soft palate and pharynx, constant pain, unable to work.	11/7/11 .6 g. i.v.	.....	.....	.....
141	E.E. ...	M.	48	Tertiary S. Infected 1907. Now has mass in perinæum, partially obstructing the urethra.	11/7/11 .3 g. i.v.	18/7/11 .3 g. i.v.	.....	.....
142	H.G.G.	M.	28	Secondary S. Infected June, 1910. Hemiplegia began 9/7/11, complete next day with aphasia.	11/7/11 .3 g. i.v.	18/7/11 .3 g. i.v.	8/8/11 .3 g. i.v.	.....
143	M.D. ...	F.	18	Secondary S. Infected about May, 1911. Admitted on 11/7/11 for puerperal septicaemia, 4 days after confinement, with secondary rash, and many ulcers of labia and vagina.	12/7/11 .6 g. i.v.	.....	.....	.....
144	E.W. ...	F.	17	Secondary S. Infected about May, 1911. Papulo pustular rash. Severe ulceration of both tonsils. Sent in as "Septic sore throat."	12/7/11 .48 g. i.v.	.....	.....	.....
145	A.C. ...	F.	23	Secondary S. Infected two years ago. Treated actively with Hg. Right naris badly ulcerated, large spreading ulcer on chin and on right elbow.	14/7/11 .6 g. i.v.	21/7/11 .6 g. i.v.	.....	.....
146	J.C. ...	M.	42	Secondary S. + Phthisis. Ulceration of anus; ? tubercular.	14/7/11 .6 g. i.v.	.....	.....	.....
147	M.P. ...	M.	23	Secondary S. Infected on May, 1911. Chancre of prepuce and macular rash.	14/7/11 .6 g. i.v.	21/7/11 .6 g. i.v.	.....	.....
148	H.K. ...	M.	31	Secondary S. Infected 1911. Ulcer on right side of penis, and two ulcers on left leg, tertiary in appearance.	14/7/11 .6 g. i.v.	21/7/11 .6 g. i.v.	.....	.....
149	C.B. ...	M.	19	Primary S. 3 chancres 3 weeks ago ...	18/7/11 .6 g. i.v.	.....	.....	.....
150	N.E. ...	M.	27	Primary S. Exposure on 16/6/11, chancre 10 days later, then bubo right groin.	18/7/11 .6 g. i.v.	28/7/11 .6 g. i.v.	.....	.....
151	D.H. ...	M.	19	Secondary S. Paraplegia since 25/11/10, when it developed suddenly.	18/7/11 .3 g. i.v.	.....	.....	.....
152	K.S. ...	F.	45	Tertiary ulcers of right leg of many years duration, unhealed for 3 years.	18/7/11 .3 g. i.v.	.....	.....	.....

Wassermann Reactions.				Weight gain.	General Result up to 10/8/11.
+	.....	.....	.....	.....	The ulceration and eczema entirely cleared up in 4 weeks. 10 days after injection she developed an erythematous blotchy rash of trunk, arms, and legs, with temperature up to 103°. This lasted 3 days, then subsided.
26/6/11	.....	.....	.....	.....	All condylomata and ulcerations gone in less than 10 day, after first injection.
.....	.....	.....	.....	.....	Chancre completely healed 14 days after first injection.
.....	
++	++	.....	.....	5 lb. in 2 weeks,	6 days after first injection phimosis much reduced, and condylomata smaller and dry. 7 days later could fully retract prepuce. Condylomata were all gone, and throat was well.
5/7/11	31/7/11	.....	.....
++	+	.....	.....	2 lb. in 2 weeks.	Discharged, 31/7/11; rash all gone.
10/7/11	31/7/11	.....	.....
++	.....	.....	.....	.....	Discharged at his own request next day after injection, to return in seven days for second injection. Has not, so far presented himself.
12/7/11	.....	.....	.....
+ slight	.....	.....	.....	11 lb. in 23 weeks.	The general condition improved greatly after the injections. The perineal mass, however, increased in size, and incision on 9/8/11, gave vent to about 1 drachm of pus. The swelling was probably not gummatous.
3/7/11	.....	.....	.....
++	.....	.....	.....	.....	In four days from first injection he regained power in right leg, and could speak intelligently. Has gone on improving and now, on 10/8/11, can stand can and talk distinctly, and has only paresis of right arm.
12/7/11	.....	.....	.....
++	.....	.....	.....	.....	After injection which was done at same time as curettage, temperature fell and remained normal six days. In this time all the sores healed. Then temperature rose again, and septicæmia pyrexia still continues.
14/6/11	.....	.....	.....
.....	.....	.....	.....	.....	24 hours after injection the throat felt better and the pustules were visibly drying up. Discharged at her own request on 29/7/11, declining second injection. All signs gone except pigmented scars.
—	—	+ slight	.....	6 lb. in 2 weeks.	Immediate improvement. 3 weeks after first injection all ulcers were healed and he was discharged by his own request on 4/8/11.
17/7/11	24/7/11	2/8/11	.....	
—	—	.....	.....	1 lb. in 3 weeks.	Ulcer surrounding anus remains about the same.
1/5/11	17/7/11	.....	.....
++	.....	.....	.....	.....	2 days after injection chancre was well healed and rash gone. Discharged 23/7/11.
12/7/11	.....	.....	.....
+	.....	.....	.....	4 lb. in 3 weeks.	All the ulcers at once began to heal. Discharged by his own request, on 9/8/11, with one ulcer quite healed and the other much smaller and healthy.
10/7/11	.....	.....	.....
—	.....	.....	.....	.....	24/7/11, discharged at his own request. Chancres completely healed.
12/7/11	.....	.....	.....
+ slight	.....	.....	.....	1 lb. in 2 weeks.	By 7/8/11 chancre was half former size (but still about size of threepenny piece, and bubo had disappeared. Discharged by his own request.
17/7/11	.....	.....	.....
—	+ slight	.....	.....	.....	No improvement followed the one small dose given.
26/4/11	12/7/11	.....	.....
.....	.....	.....	.....	.....	By 7/8/11 ulcers soundly healed.

No.	Initials.	Sex.	Age.	Clinical Summary.	Salvarsan Injections.			
153	I.M. ...	M.	48	Tertiary ulceration, extensive and deep, of both legs. Of 7 years duration.	18/7/11 ·3 g. i.v.	.....	.....	.....
154	A.S. ...	M.	54	Primary S. Infected 2 weeks ago. Induration of prepuce and phimosis.	21/7/11 ·6 g. i.v.	.....	.....	.....
155	W.F. ...	M.	27	Tertiary S. Infected 8 years ago. Indolent painful ulcer over right patella, probably a broken-down gumma.	21/7/11 ·6 g. i.v.	28/7/11 ·6 g. i.v.	.....	.....
156	I.P.G. ..	M.	30	Secondary S. Infected in February, 1911. Scattered papules on forehead and back of neck.	21/7/11 ·6 g. i.v.	28/7/11 ·6 g. i.v.	.....	.....
157	D.Q. ...	M.	30	Secondary S. Infected in April, 1911. Two chancres on glands, generalised papular eruption.	25/7/11 ·6 g. i.v.	1/8/11 ·6 g. i.v.	.....	.....
158	H.M. ...	M.	19	Secondary S. Infected April 1911. Alopecia, copious maculo-papular rash. Condylomata, ulcers of mouth and fauces. Pain on swallowing any solid food.	25/7/11 ·6 g. i.v.	1/8/11 ·6 g. i.v.	.....	.....
159	B.A. ...	M.	27	Tertiary S. Has been treated here for 4-5 years. Now chronic ulcers of right foot.	25/7/11 ·6 g. i.v.	.....	.....	.....
160	J.D. ...	M.	35	Tertiary S. Infected 16 years ago. Several punched-out ulcers on inner side of right knee.	25/7/11 ·6 g. i.v.	.....	.....	.....
161	M.S. ...	F	48	Tertiary S. Broncho-pneumonia. Thrombosis of left femoral vein. Cachexia.	27/7/11 ·3 g. i.v.	.....	.....	.....
162	B.V. ...	M.	44	Pernicious anæmia of 3 years duration. Blood examination on 18/7/11 showed red cells, 856,200; white, 3,400; and Hb. value, 29 per cent.; colour index, 1·17; several megaloblasts seen.	27/7/11 ·3 g. i.v.	.....	.....	.....
163	A.H. ...	M.	27	Secondary S. Infected February, 1911. Ulceration of tonsils.	28/7/11 ·6 g. i.v.	4/8/11 ·6 g. i.v.	.....	.....
164	A. ... (Malay).	M.	30	Primary S. Induration of prepuce and phimosis.	28/7/11 ·6 g. i.v.	.....	.....	.....
165	J.F. ...	M.	34	Primary S. Chancre on prepuce, 12/7/11. Considerable pain.	28/7/11 ·6 g. i.v.	.....	.....	.....
166	L.F. ...	M.	24	Secondary S. Condylomata round anus.	28/7/11 ·6 g. i.v.	8/8/11 ·6 g. i.v.	.....	.....
167	T.S. ...	M.	27	Tertiary S. Infected November, 1907. Wasting, loss of power, and pain in his lower limb since January, 1911.	28/7/11 ·6 g. i.v.	4/8/11 ·6 g. i.v.	.....	.....
168	M.M. ...	M.	28	Secondary S. Infected February, 1911. Ulcers of mouth and fauces. Condylomata round anus.	1/8/11 ·6 g. i.v.	.....	.....	.....
169	S.S. ...	M.	34	Tertiary S. Infected 3 years ago, had then very severe naso-pharyngeal ulceration. Still has some osteo-necrosis in nose, with ozæna.	1/8/11 ·6 g. i.v.	8/8/11 ·3 g. i.v.	.....	.....
170	F.F. ...	M.	37	Tertiary S. Infected 18 years ago. Tongue bears typical tertiary ulcer, but chief complaint is of symptoms suggestive of œsophageal obstruction.	1/8/11 ·6 g. i.v.	8/8/11 ·3 g. i.v.	.....	.....
171	A.P. ...	F.	54	Tertiary S. Infected on finger 24 years ago. Since then extensive ulceration of all parts of body. At present worn-out and miserable, with painful ulcer of right thigh, several small ulcers of left calf, and some mucous patches on tongue. Saliva excessive in consequence of the tongue condition.	1/18/11 ·6 g. i.v.	10/8/11 ·48 g. i.v.	.....	.....

Wassermann Reactions.				Weight gain.	General Result up to 10/8/11.
.....	.....	.....	.....	.....	Ulcers took on healthier appearance at once after injection. By 7/8/11 less than half former size, and much less deep.
—	—	.....	.....	.....	Circumcised on 19/7/11. Wound healed by first intention, no further symptoms as yet.
19/7/11	24/7/11	.....	.....	.....
++	++	.....	.....	.....	Pain in knee ceased abruptly after the first injection, ulcer became healthy, and was almost healed on 31/7/11, when he was discharged by his own request.
19/7/11	31/7/11	.....	.....	.....
+ slight	.....	.....	.....	.....	Discharged on 29/7/11, by his own request. Rash almost gone.
17/7/11	.....	.....	.....	.....
+ slight	.....	.....	.....	.....	Discharged on 2/8/11, with chancres almost healed and rash faded.
24/7/11	.....	.....	.....	.....
++	.....	.....	.....	.....	24 hours after first injection the soreness of throat had ceased. Ulcers of mouth and throat healed in a few days. Violent reaction after second injection, temperature up to 105°; vivid red blotchy rash on head, trunk, and limbs. Diarrhoea. All subsided 8 days after injection.
26/7/11	.....	.....	.....	.....
++	.....	.....	.....	.....	Allowed to leave next day after injection, to return later for second dose.
26/7/11	.....	.....	.....	.....
+ slight	.....	.....	.....	.....	Allowed to leave next day after injection, to return later for second dose.
26/7/11	.....	.....	.....	.....
++	.....	.....	.....	.....	The injection [3 g.] produced no improvement. She became steadily weaker from the day of her admission (13/7/11), and died on 10/8/11.
2/8/11	.....	.....	.....	.....
.....	.....	.....	.....	.....	Salvarsan produced no effect, good or bad
.....	
—	—	.....	.....	.....	9 days after first injection, throat was quite healed.
26/6/11	31/7/11	.....	.....	.....
.....	.....	.....	.....	2 lb. in 1 week.	Circumcised on 27/7/11. Wound healing well.
.....	
24/7/11	.....	.....	.....	.....	Pain diminished at once after injection, and on 4/8/11 he asked to be discharged, declining a second dose.
.....	.....	.....	.....	.....	Condylomata all healed 9 days after first injection.
24/7/11	.....	.....	.....	.....
+ slight	.....	.....	.....	.....	1 week after first injection, patient was satisfied that the leg was stouter and stronger, and that he had less pain in it.
31/7/11	.....	.....	.....	.....
++	.....	.....	.....	.....	5 days after injection, said he felt better than for 6 months past. All ulcers in mouth and throat were healed, and the condylomata shrunken and painless.
31/7/11	.....	.....	.....	.....
+ slight	.....	.....	.....	.....	Discharged at his own request on 9/8/11. No change in nose up to then.
31/7/11	.....	.....	.....	.....
+ slight	.....	.....	.....	.....	Condition of tongue much improved. Is uncertain whether there is yet any change in his oesophageal symptoms.
2/8/11	.....	.....	.....	.....
++	.....	.....	.....	.....	24 hours after first injection the ulcers were painless, and there was less salivation. 7 days later the ulcers were healed, and she felt better than for years past.
2/8/11	.....	.....	.....	.....

THE WASSERMANN REACTION.

(A SERO-DIAGNOSIS OF SYPHILIS.)

By A. E. FINCKH, M.B. (Syd.).

(A statement of the technique of the reaction and of the significance given to it in the laboratory of Professor Wassermann, in Berlin.)

It is a remarkable fact that almost every worker, who occupies himself with the Wassermann reaction, before very long seems to have set himself the task to make some alteration, thereby, presumably, modifying the so-called original method. On the other hand, it is a remarkable and significant fact that most of these workers who suggest such modifications are not at all cognisant of the detailed technique of the original method. The fault may lie in the fact that in any but German literature there seems to be no detailed account of Professor Wassermann's own technique.

The writer, after having similarly dabbled in modifications, had the good fortune to spend a month of solid work in Professor Wassermann's own laboratory, and, recognising the value of a plain comprehensible statement of the technique there employed, has undertaken to give in these pages a detailed account thereof.

The Wassermann reaction is a sero-diagnostic reaction, depending upon the method of the fixation of the complement, as first described by Bordet and Gengou.

The following terms, which are constantly being used in connection with the reaction may well first be explained:—

- (1) *The Antigen*.—Any substance which, when injected into a living organism, gives rise to a product of reaction, the antibody, is known as an antigen. Such antigen may be of a most varied nature; it may consist of living or dead bacteria or their extracts, it may be some albuminous substance, or actual cell-elements, as red blood-corpuscles.
- (2) *The Antibody*.—Also known as the amboceptor or immune body. This is the product of reaction in an organism after the injection of the antigen. The antibody is always specific—that is, every antigen will give rise to an antibody which is reactionary to that particular antigen only. For instance, if we inject sheep's red blood-corpuscles into a rabbit we produce in the serum of the rabbit an antibody specific for these red cells, and these only. In this case the antibody is known as a hæmolysin, since its presence makes itself known by a dissolution of the red cells.
- (3) *Complement*.—In every serum there is contained a hypothetical substance known as the complement. A serum heated for a certain time at a certain temperature no longer contains such complement. A serum from which a complement has been removed is said to have been inactivated. The presence of the complement is essential for the inter-

action between any antigen and its corresponding antibody if the latter is of the nature of a hæmolysin. Such antibodies as antitoxin and agglutinin, on the other hand, do not require the presence of the complement. The former antibodies are known as amboceptors, because, as the name implies, they seize both the antigen on the one hand, and the complement on the other, before the characteristic change, in our case hæmolysis of the red cells, can make itself felt.

A system as above described, consisting of its three components, is known as a hæmolytic system. It consists, in our case, of—

- (1) Sheep's red blood-corpuscles.
- (2) The hæmolytic amboceptor.
- (3) The complement.

Such a hæmolytic system is made use of as an indicator in all reactions of complement-fixation. If we wish to test any serum for the presence of any suspected amboceptor we add the corresponding antigen to that serum, and then some complement. If the antibody is present it will become anchored to its antigen, whereupon the complement in its turn is also seized upon, and all three become firmly united. If, then, we add the two known components, antigen and amboceptor, of our hæmolytic system to the above tests, hæmolysis of the red cells will depend upon the complement being available or not. If the antigen in the test has found its corresponding amboceptor, the latter will be anchored to the antigen on the one side and to the complement on the other; the complement has thus become fixed; it is thus no longer available to complement the interaction between the antigen and amboceptor of the hæmolytic system. Hæmolysis will then not take place; the test is then said to be positive, because it has demonstrated the presence of the suspected amboceptor.

The Wassermann reaction thus requires five reagents:—

1. The specific antigen.
2. The specific antibody, *i.e.*, the patient's serum.
3. The complement.
4. The hæmolytic antibody.
5. Sheep's red blood-corpuscles.

In a paper of this kind, dealing with the reaction from a practical point of view, we cannot enter into discussion of the still doubtful question as to whether in the Wasserman reaction for syphilis we are concerned with a specific antibody of the nature of an amboceptor or not. We shall speak of the antigen during these tests regardless of its origin, be it made from a foetal syphilitic organ supposed to be containing the extract from the *spirochæta pallida*, or be it merely the extract from a normal organ.

1. The *antigen* is prepared from a syphilitic liver, or from normal calf's or guinea-pig's heart. Add fifty times the weight of absolute alcohol after rubbing down to a pulp in a mortar; place at 60 degrees in an incubator for one and a half hours, shaking several times at intervals. Then filter, when the extract is ready for use.

2. The *specific antibody* is looked for in the patient's serum to be tested. The blood is obtained by venipuncture or other suitable method; at least 3 cubic centimetres of blood should be obtained so as to allow of a repetition of the test and of testing with several antigens if thought necessary. The blood is allowed to coagulate, the serum is drawn off and heated at 55 degrees for thirty minutes for inactivation. This serum must be kept in a cool place, and should certainly not be exposed to sunlight. Thus preserved, it can be tested after several days, if necessary. Investigation of the blood must be done within four hours after obtaining the specimen.

3. *The complement*.—A guinea-pig is bled to death, the blood is allowed to coagulate, the serum thoroughly separated by centrifugalisation and drawn off. It must be carefully kept in the ice-chest, and must not be used when older than twenty-four hours.

4. *The hæmolytic antibody*.—The rabbit is injected three times into an ear-vein at intervals of five days with washed sheep's red corpuscles. The first injection consists of 2 cubic centimetres of concentrated red blood-corpuscles; the second of $1\frac{1}{2}$ cubic centimetres, diluted with equal parts of normal saline; the third injection consists of 1 cubic centimetre, similarly diluted. Five days later a sample of serum is obtained and tested after being inactivated. If the titre is not less than 1 in 1,000 the animal is bled to death, and the serum obtained and inactivated as described above. Such amboceptor can be employed for months.

5. *The sheep's blood corpuscles*.—Blood is obtained either by venipuncture, or at the abattoirs when the sheep are being killed. It is defibrinated by shaking. The red cells are obtained by centrifugalisation, and are then washed three times with normal saline in order to free from the serum. Such cells can be used for several days if kept in the ice-chest, but so soon as the slightest indication of hæmolysis occurs they must be discarded.

The Technique as employed in Professor Wassermann's Laboratory.—All the reagents, with the exception of the amboceptor, are used in a constant dose. The amount of the amboceptor alone varies, and is determined for every test in the so-called preliminary test. Every time when new dilutions of the reagents are made up such preliminary test must be performed; nor should the same dilutions be used after more than six hours without repeating such preliminary test. The amboceptor dilution should not be used more than four hours after being made up. Each reagent is made up to one-half a cubic centimetre with normal saline; hence the total amount of fluid, since there are five reagents for each test, comes up to $2\frac{1}{2}$ cubic centimetres; in the controls where one or other of the reagents is left out

the bulk of $2\frac{1}{2}$ c.cm. must be made up with normal saline. The following is the dose used for each test:—

- (1) The human serum, .1 cub. centimetre.
- (2) The complement, .05 c.cm.
- (3) The red cells, .025 c.cm.

Which, if brought up in each case to .5 c.cm., gives the following dilutions with normal saline:—

- (1) For the serum, 1 in 5.
- (2) The complement, 1 in 10.
- (3) Red cells, 1 in 20.

Before making a test, the amounts of each reagent required must be carefully calculated, so as to obviate fresh dilutions having to be made in order to complete the test, which would require a fresh preliminary test.

The Preliminary Test.

This is for the purpose of testing the combined hæmolytic system. In spite of the fact that the same amboceptor is used for weeks or months, and that the complement and the red cells are from a fresh supply daily, yet only the amount of the amboceptor is varied in the preliminary test. This has been found to be all that is required in testing the hæmolytic system.

The amboceptor is tested in dilutions from 1 in 100 up to 1 in 6,400.

Begin by making a 1 in 100 dilution, say, .1 c.c.m. of amboceptor, plus 9.9 c.cm. of normal saline. Take eight test-tubes; to each of the first seven tubes add half a c.cm. of normal saline. To tube one add half a c.cm. of the 1 in 100 amboceptor dilution, making the dilution in tube 1 as 1 in 200. Of this mixutre place half a c.cm. into tube 2, which will then be a dilution of 1 in 400. Continue this process up to tube 6, which will contain a dilution of 1 in 6,400. Of this last dilution discard half a c.cm. Each of the first six tubes now contains half a c.cm. of the varying amboceptor dilution. Now add to each tube up to tube 7 half a c.cm. of the complement-dilution; then add to each of the eight tubes half a c.cm. of the red cell-dilution. Then add 1 c.cm. to each of the first seven tubes, to tube 8 add 2 c.cm. of normal saline. Each of the eight tubes now contains $2\frac{1}{2}$ c.cm. Tubes 1 to 6 contain red cells, complement and amboceptor; tube 7 contains red cells and complement, whereas tube 8 contains red cells only. The last two tubes are used as controls. After shaking well they are incubated at 37 degrees for one hour in the incubator, or for thirty minutes in the hot-water bath. Examine after ten, twenty, and sixty minutes, and read off the degree of hæmolysis. If the water-bath is used, the reading takes place at five, ten, and thirty minutes.

If at the end of the specified time complete lysis has taken place in the dilution of 1 in 1,600, but not in the dilution of 1 in 3,200, we

look upon the former dilution as the titre of the amboceptor for this particular test. The tubes 7 and 8, being controls, must show no signs of hæmolysis. The dosis of the amboceptor to be used is, if we work with the incubator, four times stronger than indicated—that is, with the above titre, 1 in 400; in the water-bath it will be eight times stronger—that is, 1 in 200.

The Main Test.

This consists of two steps. The first is the mixing and incubation of the antigen with the serum to be examined and the complement. The second step consists of the addition, after incubation of the first mixture, of the remaining components of the hæmolytic system, the hæmolytic amboceptor, and the red-cell-dilution.

Proceed as follows:—For every serum to be tested we require two tubes, placed in rows 1 and 2 respectively. Add two tubes for each of the controls—that is, a certainly syphilitic serum; and a certainly non-syphilitic serum; add also a further tube in row 1 for a third control tube, to contain antigen only.

In row 2 we have thus a tube corresponding to each of the sera to be tested, as well as for the control sera. Into each of these place 1·2 c.cm. of normal saline; then add of each serum to its corresponding tube ·3 c.cm.—that is, three times the required amount. Then out of each tube of row 2 remove into the corresponding tube in row 1 one-half of a c.cm. of the dilution; thus, each tube in the front row now contains half a c.cm. of a 1 in 5 dilution, whereas row 2 contains in each tube a double dose of each corresponding serum. The next step is the dilution and distribution of the antigen. The amount of the antigen has previously been determined. Let us consider, in our case, that it is ·1 c.cm.—that is, we require for each serum ·1 c.cm. of antigen, and a further ·1 c.cm. for the control tube. Thus, if we have four sera to be tested, we require, including the 3 controls, seven doses of the antigen, and since each is to be contained in half a c.cm. of a saline mixture we place in the last tube in row 1·7 c.cm. of antigen, together with 2·8 normal saline. Of this mixture we place in each of the six tubes of row 1 half a c.cm., while the last tube in row 1 contains the remaining half c.cm., to which, in order to bring it up to the required bulk of 1 c.cm., is added half a c.cm. of normal saline. Finally, we place ·5 c.cm. of the complement dilution into each tube of both rows. After being well shaken, they are incubated at 37 degrees c. for one hour, if the incubator is used; or for thirty minutes in the water-bath. At the end of the required time we add the remaining components of the hæmolytic system—that is, for each tube ·5 c.cm. of the red-cell-dilution, together with ·5 c.cm. of the amboceptor dilution determined in our preliminary test. This mixture of amboceptor and red cells has been previously heated at 37 degrees from ten to fifteen minutes, in order to sensibilise the red cells. Incubation then again takes place for forty-five minutes in the incubator, and for twenty minutes if the water-bath is used. At the end of such time, if all the tubes in the back row show complete lysis, as well as the tube in the front row containing the certainly non-syphilitic serum, as well as the last tube in row 1, which contains antigen only, we can look upon the test as satisfactory, and the

remaining tubes are read off. It is usual to note down the degrees of lysis as follows:—

Complete hampering of lysis.

Almost complete hampering.

Almost complete lysis.

Complete lysis.

As regards making a complete diagnosis from the above readings, the following rule is adopted in Professor Wassermann's laboratory:—A serum is looked upon as positive only when complete hampering has taken place. All complete and incomplete reactions are looked upon as negative. Only in such cases where an incomplete reaction can be explained by the existence of a known syphilitic infection, or where previous anti-syphilitic treatment has been used, is it permissible to call such incomplete reactions slightly positive, and to look upon them as a positive indication of the disease.

As regards the possibility of other diseases interfering with the diagnosis, we may safely say that only malaria and tubercular leprosy have to be considered in Australia.

It has been said that once all the details of the original Wassermann technique have been mastered the necessity for modifications no longer exists. May this description of the technique help others to come to the same conclusion, and may it help to save much time and annoyance to those who are obliged to learn the reaction from the available literature on the subject.

SALVARSAN AS A THERAPEUTIC AGENT IN THE HANDS OF THE GENERAL PRACTITIONER.

By A. E. FINCKH, M.B. (Syd.).

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FROM the title of this paper it will be seen that the writer wishes to deal with this question from a practical point of view—that is, the drug in the hands of the general practitioner. Hence we are not concerned with more of the purely scientific aspect of the question than is absolutely necessary in order to be able to follow intelligently the various steps during the administration of the drug.

Salvarsan is obtained in sealed glass tubes, each containing .6 gramme. Its colour is light-yellow; any alteration of this colour to gray or brown should be looked upon as an indication of deterioration, and such an altered specimen should not be used for administration. The drug, when exposed to the air, undergoes rapid oxidation, with a considerable increase in its toxicity. It must, therefore, be made up freshly immediately before use.

The contents of the drug in arsenic is 34 per cent.

It is easily soluble in water; its reaction is acid.

The drug acts directly on the parasite of syphilis, destroying it, whereas its action on the human tissues is perfectly harmless.

The question as to whether the general practitioner should, or should not, himself administer the drug is one which every man must decide for himself, just as he must decide for himself whether he is going to do operative work or not.

There is certainly nothing to contra-indicate its use in the hands of the general practitioner. There is no other drug which, before being given into the hands of the profession, was placed upon so extensive and severe a trial as salvarsan. On that point everybody who administers it can rest absolutely assured, and he is running no risks for his patients. Indeed, the risks in giving salvarsan are less than in administering chloroform; and who, nowadays, is going to refuse to use that anæsthetic because there is a recognised death-rate of 1 in 2,000? The death-rate in salvarsan is not 1 in 50,000.

However, before the general practitioner decides to take up the administration of the drug he should make himself thoroughly conversant with all the details of the technique. He should be prepared to take upon himself all the blame of any possible accident or misadventure, for, if such should occur, it will certainly be due either to faulty technique—and faulty technique, in my opinion, always means neglect of ordinary aseptic precautions—or it will be due to the fact that the drug has been employed in cases where its use was altogether contra-indicated.

Having made up his mind that he is going to learn to administer the drug, the next step for him to take is to decide upon the method he is going to adopt.

Of the methods of application there remain now only two which have to be considered—the intra-muscular and the intravenous. Personally, the writer refuses to do anything but the intravenous, not so much because he is of opinion that the intravenous is so much superior, but simply for his own protection. In 99 per cent. of cases treated intravenously one is able to promise a patient that he will be able to follow his ordinary occupation on the second day after injection. With intra-muscular injections, however, that is not the case. One is never quite certain how long one has to listen to the, perhaps, woeful tales of stiffness, painful swelling, and shooting pains, and every now and then such things as necrosis at the site of injection will occur in spite of all ordinary precautions. We all have a case of this kind sooner or later, and it is then, and then only, that we finally decide to insist upon the administration of the drug by the intravenous method.

When we consider the seriousness of syphilitic infection, and when we place before our patient the differences and the various risks of the different methods of administration, there should be no difficulty in having it all our own way.

Therefore, let us insist upon the intravenous method.

Before going into detail as regards the technique, we should, perhaps, consider the question of indications and contra-indications for its use.

As an indication for the drug we may place, in first line, all cases of syphilis with progressive manifestations, be they primary, secondary, or tertiary. Secondly, all cases of latent syphilis which give a positive Wassermann reaction. Thirdly, all doubtful cases of tabes and general paralysis of the insane.

As contra-indications thus are to be considered, above all, certain diseased conditions of the heart; it must be remembered here that

whereas a well compensated valvular lesion is by no means a contra-indication, any condition indicating general weakness of the heart, such as palpitation, tachycardia, &c., must be carefully considered before the drug is administered. Diabetes, if severe, chronic nephritis, acute tuberculosis, and advanced stages of carcinoma must be looked upon as direct contra-indications; so also chronic bronchial catarrh and emphysema; aortic insufficiency, as well as aneurism of the aorta, must also be looked upon as contra-indications, together with all cases of widespread arterio-sclerosis. In active syphilis of the brain the drug should be used, though only in small doses; whereas in cases of general paralysis, especially when previous apoplectic attacks are indicated by paralysis, the case had better be left untreated.

Methods of Administration.—Although we have above advocated the exclusive use of the intravenous method, yet one must confess that in private practice, especially when we are dealing with lodge patients, it may become absolutely necessary to employ occasionally the intra-muscular method. At Sydney Hospital there has been introduced a method of treatment in the outdoor department which, on the whole, does not seem to inconvenience the patients to the extent of preventing them from following their ordinary occupation. They are given six weekly injections of .2 gramme. The injections are made into the buttock, in the outer and upper portions of the glutens medius muscle. The injection must be made into the substance of the muscle itself. The needle must first be introduced without the syringe, in order to see that it has not penetrated any large vessel, which would be indicated by bleeding. If such occur the needle must be withdrawn, and reinserted. The drug can be conveniently made up in olive oil, previously sterilised by boiling. One cubic centimetre is used for every tenth of a gramme of salvarsan. It is rubbed down in a mortar until quite smooth. Absolute asepsis is, of course, indispensable.

Or the drug is injected as an alkaline solution, made up as follows:—Place 10 cubic centimetres of hot distilled water into a small glass-stoppered bottle, add the salvarsan, and shake well until quite dissolved, with the exception, perhaps, of some small gelatinous-looking particles. Now add gradually for each .1 gramme of the drug half a cubic centimetre—that is, 3 c.cm. of normal sodium hydrate; that is, a 4 per cent. solution. At first a heavy precipitate comes down, which, on further addition of the sodium, redissolves. Go on adding this until the solution is almost, but not quite, clear. This cloudy solution is similarly injected as the above oil mixture.

If one is able to order the patient into bed after the injection, it has been recommended to inject the full dose, divided between the two glutei, at the one sitting. However, the repetition of smaller doses renders the occurrence of necrosis less liable, and is therefore to be preferred.

As regards the syringe, one with a glass piston is very useful. It must be perfectly dry, or else it is liable to jamb. Previous washing out with ether, and then drying, will prevent this.

The Intravenous Method.—The apparatus required appears somewhat complicated. It consists of two infusion tubes, each capable of holding 200 c.cm. A rubber tube from each leads to a glass Y tube, each tube being supplied with a clamp. To the free end of the Y piece another rubber tube is attached, into which, near its end, a piece of glass tubing is inserted, so as to enable us to watch for air-bubbles and other impurities, passing down. The needle is to be attached to the free end of the tube. The whole of this apparatus is hung up so as to be about 2 feet above the patient, having been previously sterilised by boiling. Both tubes are filled with normal saline solution; after all air-bubbles have been carefully removed, the free end is clamped.

The drug is prepared as follows:—Place about 20 c.cm. of hot distilled water in a glass-stoppered bottle; add the salvarsan and shake up until dissolved. Now add for each .1 gramme of the drug .7 c.cm. of normal sodium hydrate solution—that is, since the tube contains .6 gramme salvarsan, we add 4.2 of the sodium mixture. At first a heavy precipitate will come down, but on further addition of the sodium mixture this will redissolve. The solution must be absolutely clear, and to reach this point it may be necessary to add as much as 5 c.cm. of the sodium mixture. If this solution refuses to clear up the fault lies either with the water used or with the drug. In either case it cannot be used for injection. This clear solution is now filtered through some sterile gauze into a larger bottle, which is filled up to 150 or 300 c.cm. with normal saline. The drug is now ready for injection.

We now empty one of the infusion tubes of its normal saline, and, after clamping the rubber tube below it, add the drug in solution. The patient will now lie under the apparatus, either in bed or on the operating table. A suitable vein is looked for near the bend of the elbow; the upper arm is constricted by means of the tourniquet until the pulse at the wrist is nearly obliterated. The site for the injection is rendered sterile, and the needle, without being attached to the tube, is pushed into the vein. If we have succeeded in getting the needle into the vein, blood will begin to pour from it, while no tumour will become apparent under the skin. If we have satisfied ourselves as regards these two points, the tourniquet is relaxed, and the tube from the apparatus, while the saline is running from it, is pushed on to the needle. By this manœuvre, while the saline is running from the tube and the blood from the needle, it is quite impossible for any air-bubbles to be introduced. We then watch to see if the saline is running; at the same time we watch for the possible appearance of a tumour under the skin, near the site where the needle was introduced. If, while the saline is running, indicated by the lowering of its level in the infusion tube, no tumour appears, we are assured that the passage into the vein is free. We now clamp the saline tube and open the salvarsan tube. As soon as the required dose has run in we clamp the salvarsan tube and again open the saline tube, and allow so much of the saline to run into the vein until the glass tube near the needle shows the clear saline to be passing through, thus preventing, during the removal of the

needle, any of the drug to remain at the site of injection, and thereby preventing any possible necrosis. The needle is now removed, and the puncture is sealed with collodium.

The patient is not allowed to walk back to bed after the injection, and is kept strictly in bed for at least twenty-four hours. The after-effects are very variable; there may be a rigor and rise of temperature within a few hours after injection; there may be abdominal pain, vomiting, and diarrhoea, all of which subside usually within twelve hours. On the other hand, it is not at all uncommon to miss all the above symptoms with the exception, perhaps, of a small rise in temperature.

The dose of the drug and the repetition of the injection.—No case should be treated by less than two injections. The first dose in a healthy male adult will be .4 gramme; for a male adult in a reduced condition, and in a healthy female adult, .3 gramme. As a second dose in a healthy male adult give a full dose of .6 gramme; in a weakly adult or healthy female adult, give .4 to .5 gramme. In tabes or conditions of the central nervous system give a first dose not exceeding .3 to a male and .2 to a female adult. A second dose, according to the improvement noticed, would be up to .4 in the female and .5 in the male, and a third similar dose. In children it is best to go by the body weight. Give .01 gramme for each 2 lb. in weight.

The second dose may be given as early as the seventh day after the first, but it is best to wait about fourteen days.

The next question which the practitioner will put is: Are we justified to look upon a patient treated with such two or three injections as cured? This, of course, is a question which can only be answered very guardedly; but I think that we have a perfect right to follow the advice of those who have given this matter, since the introduction of the remedy, their most careful attention.

According to such authorities, we can do so; but we shall naturally always explain the position of affairs at least to our more intellectual patients with the advice that they should immediately seek advice on the appearance of any doubtful symptoms, and indeed to submit themselves for examination every three months or so.

I hope that in giving this detailed account of the technique for the administration of this new remedy I may be able to induce many of you to give it the attention it deserves.

There is still much controversy as regards the ultimate results of the use of the drug, but even now, after nearly twelve months of its general application in all parts of the world, it is still considered to be the only remedy we have which, in so short a time, and so effectively, can stop the infectious nature of all active syphilitic processes. From this point alone the use of the drug deserves every consideration, and if properly carried out during, say, five or ten years in all general hospitals, the result upon the whole human race must be such as has never been experienced in the history of the medical world.

SOME PRE-CANCEROUS CONDITIONS OF THE SKIN AND MUCOUS MEMBRANES.

By H. SIMPSON NEWLAND, M.B., M.S., F.R.C.S., Adelaide,
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I HAVE written this short paper for the purpose of calling attention to conditions affecting the skin and mucous membranes, which in this country at least not infrequently lead to the development of cancer. Keratosis affecting the skin, and leucoplakia attacking the squamos-celled mucous membranes, are potential causes of malignant disease. Those who see much skin work are well aware how common keratosis is in Australia; they are well aware how often it forms the starting point of cancer, not only in the old, but even in early middle life; moreover, they are cognisant of its easy cure by modern therapeutic resources. Every case of keratosis being thus capable of originating a case of cancer, it follows that every case of keratosis cured is a possible case of cancer prevented.

As keratosis is so rife in Australia, there is a wide field for the activities of preventive medicine. To repeat a question put by his late Majesty, King Edward VII, when speaking on the subject of tuberculosis, "If preventable, why not prevented?"

It is certain that the profession is not alive to the importance of the question. It cannot, I think, be denied that a considerable percentage of cases of cutaneous cancer could be prevented from developing. It is essential to recognise that the innocence of keratosis may pass into the malignancy of epithelioma. Leucoplakia is a much less common precursor of cancer.

Keratosis is met with in both sexes, but is, in my experience, much more common in men. This is probably due to their more exposed life under the hot Australian sun. Not uncommonly sufferers say that they have a "tender skin," and are easily sunburnt. Women with the condition have usually, but not always, been exposed to the elements.

There is an undoubted family tendency to the disease. I have treated a woman with an epithelioma of the upper lip and numerous patches of keratosis on the face. A brother consulted me for keratosis and a small persistent ulcer on the mid-line of the lower lip. Another brother was treated by our President for keratosis and a rodent ulcer. I am informed that other members of the family are also sufferers from keratosis. The disease causes the development of dry yellow or brownish spots, more or less raised, and of different sizes and shapes. Some spots are quite insignificant, while others may measure half an inch or more across. The horny covering is shed at infrequent intervals, so that the appearance of the patches is liable to change. In a few cases a great heaping-up of the crust occurs, which, combined with the dirty brown colour, gives the face an unsightly appearance. Similar brown patches, not much raised, may occur on the backs of the hands. Occasionally small areas resembling telangiectases are present. When a crust is shed the

exposed surface is dry and a little rough. The disease may attack any part of the face, but, like rodent ulcer, is usually situated above the mouth. The nose, cheeks, forehead, and the temporal regions are frequent sites. The skin of the exposed part of the neck and of the backs of the hands are not uncommonly attacked. Although the disease may seem to improve from time to time, there is not a tendency for the disease to get well spontaneously, and generally fresh areas slowly and gradually make their appearance.

I have not examined microscopical sections of the lesions, but Sequeira states "that the stratum corneum hypertrophies, and sends down conical projections, the corpus mucosum is thinned, and the corium shows characteristic senile changes, notably an absence of elastic tissue, which is transformed into elaceine, and there is colloidal degeneration of the connective tissue elements. The deeper parts of the epidermis are infiltrated with round cells, while plasma cells are found round the vessels."

In the treatment of this condition I have usually employed radium, and have sometimes given X-ray exposures as well. Carbonic acid now yields very satisfactory results. Twenty cases of keratosis of the face or hands have this year come under my observation. Most of them have been treated with radium, and I cannot speak too highly of its value in such cases. Ten milligrammes of radium bromide in a vulcanite capsule, with a mica window, were applied to the affected spot, usually for one and a quarter hours. This usually sufficed. A longer or second exposure was given if any infiltration was present.

Carbonic acid snow was used in a few cases, and applied by means of McLeod's applicators for twenty to forty seconds.

Should the X-rays be selected, I give a pastille dose without a filter, and within the next few days a pastille dose through an aluminium filter 1 millimetre in thickness.

In about a week or twelve days after the employment of radium the reaction begins. If the keratinous crust is very thick pus forms underneath it, and it can be easily lifted off. If not dressed with an ointment, scabs form and reform on the patch until it is healed. If an ointment is applied, a pellicle of yellowish lymph covers the surface, and gradually lessens in size as the sore heals.

The scar left is smooth and pink. In a few months the scar becomes paler than the surrounding skin. As time goes on it becomes less and less noticeable, but never quite disappears. I have not observed the formation of telangiectases. Fresh patches of keratosis may, however, develop in other situations. Treatment applied in one or more of the ways mentioned has been uniformly successful. During this year two patients have consulted me for epithelioma of the hand developing in a patch of keratosis. In the first the growth was situated on the back of the hand; in the second the epithelioma started on the palm. The skin of the palms of the hands was as rough as a coarse file. He was indeed a horny-handed son of toil.

Rodent ulcers were present in several of the cases treated for keratosis, and have no doubt originated, in several instances, in a patch of keratosis. It would be fortunate if keratosis only drifted into rodent ulcer. Unfortunately, it not seldom passes into epithelioma, a much more formidable disease.

So far I have not referred to keratosis of the lip because I wish to consider it with leucoplakia, which is a very similar condition affecting the squamous mucous membranes of the tongue, lip, or valva. The appearance of the lip varies. In one case a flat, dry plaque may affect more or less of the muco-cutaneous surface of the lip; in another the patch may be more raised, with a rough cauliflower-like surface; in yet another patches of leucoplakia are present on the moist surface of the lip, with a superficial ulcer or a rough, dry plaque on the dry surface. Slight infiltration may be present, and very closely simulate that of cancer. Whatever the appearance of the condition, it shows no tendency to heal, and I am convinced that, untreated, it always ends in epithelioma of the lip. Drug treatment is useless.

I have met with thirteen such cases, all of which have been treated and cured with radium. One cure merits special reference. A man aged 60 was referred to me suffering from a small warty lump on the left side of the lower lip. There was slight but definite infiltration of the underlying tissues. Ten milligrammes of radium bromide were applied for fourteen hours, and two pastille doses of the X-rays were given without a filter. The successful result in this case impressed me very much, because I regarded the condition as probably epitheliomatous. Indeed, I advised wide excision of the disease and lymphatic glands, and only employed radium at the request of the patient's medical attendant.

In cases of ulceration or keratinous thickening of the lower lip, accompanied by leucoplakia, I have seen the milky patches replaced by a smooth red surface. Sufficient time has not yet elapsed to say whether the leucoplakial conditions recurs.

Some months ago I had under my care a lady who had had an epithelioma of the valva removed. I was asked to treat some small chronic irritable ulcers of the vulva, which threatened to take on malignant action. These treated under radium, but the patient subsequently succumbed to secondary deposits in the intra-abdominal lymphatic glands.

There are, of course, several other pre-cancerous conditions of the skin and mucous membranes to which I have not referred, as they have not come within the scope of my Australian experience. This short paper will, however, have served its purpose if it focuses a little more attention on the prevention of external cancer.

STAPHYLOCOCCIC INFECTION OF THE SCALP IN THE ADULT.

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PATHOLOGICAL conditions of the scalp which resist all ordinary forms of treatment are familiar to all who see but a limited number of skin diseases. Until recent years this region has been somewhat neglected by dermatologists, which is to be wondered at, when it is remembered that it offers a prolific field for investigation, and that it is a source from which widely separated areas of the skin may derive their initial infection. This indifference to its morbid exhibitions has carried its penalty; the ever-alert quack has staked off the structure as his own, from which he derives large emoluments; it is his most lucrative possession, and it will be with great reluctance that he will abandon it. Nevertheless, as investigation proceeds, and a clearer conception of the etiology of the numerous lesion follows, haphazardly prescribed medicaments—no matter how enticingly manufactured, how ingeniously advertised—will cease to attract, and the proprietors of hair invigorators and restorers shall come to mourn a growing defection amongst their clients.

Staphylococcic infection of the scalp in the adult is, I think, of more frequent occurrence than is generally supposed; the clinical picture is so obscured by superficial elements suggestive of one of the many phases we are accustomed to associate with seborrhœic disorders that it escapes recognition.

The more obtrusive features pointing to these latter, the presence of the underlying active agents, remains undetected, and so the treatment which is not directed towards their abolition proves useless.

Much confusion, it appears to me, has arisen owing to the term seborrhœa having served to embrace numerous lesions ill-defined and dissimilar, whereas it is doubtful if the condition which the term implies constitutes of itself a pathological state. So far no system has been formulated to guide us in estimating the degree necessary to establish a normal, excessive, or diminished secretion of sebum, nor is there any convincing evidence to show with which of these conditions a bacterial invasion is the more frequently associated. I am aware that the affection described is seborrhœa oleosa is regarded as the most conducive to the growth of pathogenic organisms, but I have found, in a series of carefully observed cases, pus cocci invading the follicles of the scalp, where there had never been a history of an excess in the output of sebaceous material, and this aspect, taken in conjunction with the manner of treatment adopted in these cases, and its success, very forcibly suggests the inference that it is less a question of favourable or adverse soil supplied than of efficiency or inefficiency of the resisting mechanism to cope with the microbic infection; that in this regional infection, at any rate, the excess of sebum, or change in its constituents, is of less importance than the adequate or inadequate supply of protective substances carried to the infected site.

During the past three years I have found staphylococcic infection in twenty-nine adult patients who consulted me concerning morbid conditions of this region, and in all of them I believe that this infection was the sole cause of the distressing symptoms from which they suffered; this does not imply that the original lesion was microbic; it may have been amicrobial, a traumatism caused by scratching, or a simple dermatism following the application of improper chemical materials incorporated in pomades. One can but speculate as to the nature of the agents which caused the initial lesion, since advice is not sought until a state of comparative chronicity has been reached, until many and varied procedures have been adopted and found inoperative; but what one does know with certainty is that a deficiency in anti-bacterial substances antedated infection.

From the records of my case-book I shall here narrate the epitomised history of a case, which, with some modifications as to the duration of the affection and some graduation in the objective symptoms, may be taken as representing the entire group as observed by me from the date when I first recognised the important role played by pyogenic cocci in disorders of the scalp.

M.N., a gentleman of muscular build and robust appearance, and of rigidly temperate habits; possessing an independent fortune, he followed no avocation, but nevertheless led a fairly active life. His personal and family history proved barren of noteworthy circumstances, whilst his skin, I found, bore no suggestive blemishes. For twelve years—but short periods of repose intervening—he had been troubled by the most distressing irritation of his scalp, and this combined with the ever-present consciousness that his head was defiled—he was scrupulous in the matter of cleanliness—added to his sufferings, and compelled him to lead somewhat of a secluded life. Goaded by the irritation, he had recently begun to pluck hairs from the pruriginous patches, and these he had studied with the aid of a lense. Very graphically he contrasted the sensations when epilating a hair from an infected and non-infected area; and, further, his morbid investigations had revealed to him that the roots of those epilated from the former had a gelatinous bulbous appearance, which he deemed characteristic and constant. He had no recollection that at any time there had been an excessive defluvium, his observation leading him to believe that the hairs which grew where the disease was most pronounced were darker and more vigorous than those where the scalp had never been involved.

Looking at the extra-follicular portion of this man's hair, it was difficult to believe that quite one-half of them had their intra-follicular portion embedded in pus, yet such I subsequently found to be the case. The hair of the coarse dark-brown variety grew in great profusion, and showed no lack of lustre, no atrophy, dryness, brittleness, or structural defect of any kind, from which it was safe to infer that notwithstanding the number of years during which the disease had continued the papilla had remained unaffected. On the surface of the scalp lay a thin coating of white, dry exfoliating scales, the type we associate with a simple pityriasis, scarcely sufficient material

to merit regard as the product of a morbid process. Removal of these scales—(they were most profusely distributed over the vertex and parietal regions)—disclosed no outstanding feature to account for the intensity of the symptoms complained of, and one was inclined to speculate on the possibility of intense pruritis existing without manifest lesions. There was no exudation—the dry scales suggested its absence—no induration or scarring reminiscent of recurrent inflammatory or pustular attacks. In the Impetigo of Bockhart—with which these cases have at least one feature in common—(the causal factor is the same) pustular development, is pronounced in all phases, and is frequently accompanied by sub-occipital adenopathy, and followed by areas of alopecia. These aspects were not present in the case under review, nor in any of those its history serves to outline, and it is the absence of these gross clinical evidences, and the presence of elements which, existing in greater or less degree—suggestive of that vague undetermined condition voluminously written of as seborrhœa—is calculated to mislead, if a cursory examination of the surface aspects be deemed sufficient upon which to base a diagnosis. There are periods when the quiescent picture exhibited by this patient, M.N., is not found, when the characters of an acute inflammation, with exudation and firmly-anchored, moist, greasy scales prevail; but even here pustules, if found, are widely separated, and in their discreet isolation fail to represent the generalised infection which exists. The presence and activity of the microbe appear to be concealed, and a very different course is pursued to that with which we are familiar in staphylococcic sycosis, where a zone of inflammation supports an outcrop of closely-set projecting pustules. There is, however, one objective symptom in staphylococcic infection of the scalp which I have found to be persistent during periods of regression, when all other evidences of agitation had passed away, the only one to indicate implicated follicles in this stage—this is a minute florid areola surrounding the hairs springing from these infected follicles. This areola I have come to regard as characteristic, and a most reliable indication, on a surface from which all other indications may have very completely vanished. A few hairs epilated from their florid surroundings, and transferred to the surface of an agar medium in a cotton-plugged test-tube, and incubated for twenty-four hours at a suitable temperature, furnishes direct evidence as to the identity of the exciter of this disease, and at the same time supplies the material by which they may be often rapidly, always surely, abolished. A luxuriant and pure culture of the staphylococcus pyogenes aureus is found on the agar slope—but once have I found a colony of the white coccus—and although media conducive to the growth of streptococcus have been used frequently, no growth of this organism was found. The presence of the “golden coccus” was demonstrated in the entire series of my cases, and from sub-cultures of the patient’s own organism vaccines were made.

I have long since abandoned the use of stock vaccines, even when treating diseases depending upon this organism upon which their good repute mostly rests, they proved inefficient in my hand, which is an experience, I know, that does not tally with that of others

who extensively employ vaccine-therapy. I, however, confine myself to the enunciation of my own views, fashioned in accordance with observation of results. There are certain well-understood bacteriological phenomena which contribute evidence that tends to support my clinical inferences. It is, for instance, recognised that many of the characters of a micro-organism, such as its appearance on cultivation, its power of coagulating milk and liquefying gelatine, may be altered in the laboratory by different conditions of temperature and atmosphere; alterations may also occur to it in the skin; and these alterations may modify its specificity when it is incorporated in a vaccine. Again, the superiority of the streptococcal vaccines, when endogenously made, over others not so made justifies an assumption in this direction.

Estimation of the opsonic indices of all the patients who came under my notice suffering from staphylococcic infection of the scalp showed that their serum was deficient in anti-staphylococcic opsonins, which fact of itself indicated that the essential to successful treatment lay in the stimulation of the mechanism of immunity—the rendering the defensive forces of the body more potent in their antagonism to the invading bacteria, and to maintain an average high level of resistance.

The technique employed in therapeutic inoculation is now so well defined and so universally understood that it would serve no useful purpose to refer to it here. The doses and the interspacing were, in the first twenty cases, controlled by frequent estimation of the indices. The experience, however, which I accumulated by this somewhat tedious exactness helped to guide me with sufficient precision in my later cases.

I doubt if there are other bacterial lesions of the skin which respond so rapidly, so favourably, and so surely to vaccine therapy as do those produced by the staphylococcus aureus; there is seldom a failure to record, and in the localised infection, where the scalp alone is involved, I have not so far been confronted by a single instance. Recurrences there have been where treatment had been prematurely discontinued, but the lesion following reinfection offered no greater resistance than those which followed the primary infection. A second or third course of vaccine may be demanded. The results achieved will be a permanent freedom from a distressing, and, I think, infrequently recognised disorder.

It would, I think, be ungracious, when treating of maladies affecting the scalp, to appear unmindful of the great energy and striking ability applied to them by those masters of observation, Unna and Sabouraud. They have succeeded in dissipating long-existing obscurities, and disentangling much that was involved, and to them we are proportionally indebted. Nevertheless, we find that their conclusions and teaching are sometimes at variance, which but emphasises the important fact that our knowledge of the subject is but yet fragmental, and that there remains a wide field to investigate. Hence it is obvious that every dermatologist who is anxious to promote the interests of his patients and safeguard his own prestige should omit no method likely to aid him in the routine of his

examinations, remembering that existing views are often but provisional, and that the subjects concerning which they are held demand further research, demonstration, and adjustment, for which reason, if for no other, a sound working knowledge of bacterioscopic methods is necessary. It has been said that to the modern physician the microscope is as essential as the stethoscope; to the dermatologist the former instrument is pre-eminently the more important.

LIVING EXHIBITS.

Dr. Bennett	...	...	{	Nævus linearis.
			{	Folliculitis.
			{	Eczema (general).
			{	Case for diagnosis.
Dr. Molesworth	...	...	...	Angioneurotic œdema.
			{	Monilethrix.
			{	Urticaria pigmentosa.
			{	Colloid degeneration of skin.
Drs. McMurray and Johnstone			{	Multiple benign cystic epithelioma.
			{	Burn from spirit of salts.
			{	Congenital syphilis.
			{	Hebra's prurigo.
Dr. Harris	...	...	...	Mole treated with radium.

PRESIDENTIAL ADDRESS.

(Delivered in Section of Dermatology, Radiology, and Medical Electricity, Australasian Medical Congress, Sydney, 1911.)

By F. J. GLENDINNEN, M.D., C'.D. (Brux.), L.R.C.P. (Lond.), &c.

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IN the year 1899, at the Brisbane Congress, I had the honor of reading a paper on "Skiagraphy," embracing three years' experience, dating, in fact, from the inception of the practical application of the rays as a diagnostic and therapeutic agent, and therein I stated my method of utilising the street main, energising my coil from an alternating current by means of a chemical rectifier, and also by using the Wehnelt brake (a method which has been but little improved upon in the last twelve years). The great era founded by the discovery of Röntgen has been productive of a double boon to clinical medicine and surgery, a gift of greater accuracy in diagnosis, and a gift of new forces in treatment, which, great as they are at present, are as yet but dimly realised. The surgeon in earlier years was apt to denounce skiagraphy as uncertain and misleading; but those "who came to scoff have remained to pray," and the surgeon or physician to-day is rare who does not seek the aid of X-ray pictures as an aid to diagnosis. Although it is recognised that the use of X-rays affords invaluable evidence in assisting a correct diagnosis, it must be remembered that such assistance depends upon the skill and experience, not only of the skiagraphist, but the degree of familiarity in interpreting such pictures which is possessed by the surgeon. The skiagraphist should be able to take his picture in the position best suited to display the mischief, and, if experienced, should be relied upon by the surgeon to interpret his own negatives

to the best advantage. To illustrate this I may mention a case of supposed bony growth at the lower end of the femur. A skiagram was taken, and the surgeon operated on his own interpretation of the picture, with the result that no growth was discovered. The skiagram was afterwards referred to me for interpretation, and I reported the condition shown as normal. What had been taken for bony growth was a shadow of the patella overlapping the lower end of the femur.

The general impression was (I do not know that it is so much at the present day) that there was no particular skill required either for the taking or the interpreting of the skiagraph. Such an impression is very far from the truth, as the beginner soon realises, and, in order to acquire the requisite skill, one must have a knowledge of the normal anatomy as depicted (I am now speaking skiagraphically). In other words, one requires, in addition to a knowledge of the normal anatomy of the parts, a knowledge of their normal skiagraphic appearances. Different bones give different densities, and allowance has to be made for the interposition of ridges and cancellous tissue. The best results from a skiagraph, therefore, can only be obtained from a combination of skill in taking a picture, with a not less necessary skill in its interpretation when taken.

It is now well recognised that X-ray pictures are of the utmost value in all cases of injuries to bone, especially in the neighbourhood of joints, and that they are scarcely less valuable as an aid in diagnosing the various diseased conditions to which bony tissue is liable.

The duration of an X-ray exposure may be measured as follows, according to Schall's slide rule:—

The distance between anticathode and plate in cent. mts.

The thickness of the object, cent. mts.

The penetrating power of the tube in Wehnelt units.

The number of milliamps discharging through the tube.

The dosage of X-rays for therapeutic purposes, four factors are to be considered:—

(1) The penetrating power of the tube in Wehnelt units.

(2) The number of milliamps discharging through the tube.

(3) The distance between the anticathode and part to be irradiated.

(4) The time of irradiation.

An erythema dose will be reached when taking the distance between the anticathode and the part to be irradiated at 15 cent. mts.

Benoist units	2	3	4	5	
	44	21	14	10	milliamp minutes.

Some years ago intensified screens were used in order to reduce the exposure, but got into disfavour owing to the grain of the salts being imprinted on the negative; but of recent years a new screen has come on the market, put up in a special carrier, which has, no doubt, been a means of reducing radiography, I might say, for instantaneous work. For kidney and pelvic work in stout subjects they may be an advantage, but, in my opinion, I prefer the naked plate, where it can be advantageously used.

It is worth considering, when using the screen, especially in kidney cases, whether you place the film side or the glass side to the patient. Some workers place the screen on the top of the plate, and others the plate on the top of the screen. In the former the print will represent the opposite to the subject, and in the latter it will appear on the print as in the subject. What I have been accustomed to do for some years is to orientate the plate with a stencil. I have copper stencils in alphabetical order, and I place the initial of the surname of the patient on one side and the letter R or L on the other side—right or left, as the case may be. These screens are coated with tungstate of calcium. This substance, when it fluoresces under the influence of the X-rays, gives off active rays, which affect the silver salts more readily, and hence increases the effect of the X-ray.

The use of X-rays in diagnosis has long extended beyond the domain of surgery, and in medical work, no less than surgical, the seeing eye must be educated for a right interpretation. A diagnosis of early tubercle may have to be made on the X-ray picture alone, for so experienced a clinician as Dr. Mitchell Bruce has recently stated in his experience that X-rays have more than once revealed an early phthisical lesion when the most careful physical examination elicited no signs. He said:—"I frequently meet with cases of pulmonary tuberculosis in the earliest stage, associated usually with passing hæmoptysis, in which the X-ray succeeds after the stethoscope has failed." (*Lancet*, 3rd June, 1911.)

The use of the bismuth meal shows a decided tendency to enter more into the routine of abdominal examinations in medical practice, and here again great familiarity with the normal skiagraphic appearances must be requisite before any helpful conclusion can be drawn. One difficulty is to be quite sure in what precise part of the intestine the bismuth is lying, and it seems fairly certain that some "sagging" must be produced mechanically if a large bismuth meal happens to be collected in one situation. In short, I would impress on all practitioners that he who runs cannot read X-ray pictures with accuracy. He must just walk slowly through trials and comparisons innumerable.

The time at my disposal does not permit me to more than outline some points of X-ray treatment in which I believe further progress is possible. Leaving aside, for the present, the use of X-rays in the treatment of malignant diseases in passing over their undoubted utility in various skin affections, with which you are all familiar, there are one or two more formidable conditions in which X-rays therapy deserves more extended trial and recognition.

In exophthalmic-goitre, the rays have the property of diminishing the glandular swelling, and the nervous symptoms undergo amelioration, while the general condition becomes much improved. The tachycardia is also benefited, but, for some reason, the exophthalmos is, as a rule, unaffected. The surgical treatment of this condition has recently advanced very much, but there is still a considerable mortality attaching to the operation, and the X-ray treatment is at least free from this objection. In lymphadenoma the X-rays have

the power of causing absorption of glandular masses, and I have treated several with considerable success. One in particular I should like to mention. In this case the patient was operated upon by abdominal section for deep-seated tumour, which was found to be a mass of enlarged glands. I subsequently treated him, and they disappeared.

Tuberculous Cervical Adenitis.

The excellent results, especially cosmetic results, that are achieved by the employment of X-rays in these cases are such as cannot be accomplished by other means. Cases have repeatedly come under my notice, before and after surgical removal, more especially the latter. One case I would mention, in which recurrence had taken place and large keloid masses had formed in the operation scar-tissue. Under X-ray treatment, not only was the glandular swelling absorbed, but the keloid condition disappeared.

Prostatic Enlargements.

Cases of enlarged prostate respond, as a rule, very well to X-ray treatment, especially those cases with cardiac enlargements and other complications, rendering operation inadvisable. I generally advise irradiation prior to operation, even when such is to be undertaken.

Radium.

The introduction of radium as a therapeutic agent was probably made through Becquerel receiving his burn by reason of carrying radium in his vest pocket.

A satisfactory explanation of the action of radium is still wanting. As a general thing, its action is strikingly similar to that of X-rays, and yet there are subtle distinctions, at all events in results.

Most workers, especially Wickham and Degrais, assume the existence of a selective action of radium rays on the tissue cells. No positive evidence of such action is forthcoming. A selective action might be simulated either by the fact that neoplasm cells react differently to any external stimulation from normal tissue cells, or by the different penetrative powers of differing rays.

Exner was one of the first to observe the effects of radium on tumours. He describes a new formation of connective tissue as the most striking feature. This, he states, invades the tumour and splits it up into smaller alveoli. The tumour (parenchyma) cells proper become vacuolated, and eventually absorbed.

Neuberg made experiments on cancerous tissue, and states that autolytic ferments are more abundant in cancerous than in normal tissue, and concluded that the action of such autolytic ferments was not inhibited by radium, whereas other ferments were.

Schwarz first observed the action of radium on lecithin. His experiments were based on the assertion that neoplasm cells contain more lecithin than cells of normal tissue. He found lecithin decomposed after exposure to radium; more recently Werner introduced lecithin, after exposure to radium, into animals, and produced effects identical with those following direct exposure to radium.

Obestiner states that nervous tissue which is rich in lecithin is not affected by exposure to radium.

My own hypothesis (of course, purely theoretical) is that radium induces increased local leucocytosis from chemico-tatic influence over the irradiated area. If this local leucocytosis be carried to excess it results in sloughing, but if carried to the right point phagocytic action takes place, and the normal tissue state is regained.

My method of treating cases with radium depends entirely on its situation. If it be a small superficial growth, I merely put the radium applicator without a screen, but protected by a thin sheet of rubber tissue, which I have been accustomed to use for some years.

Should the growth, say, be as large as a threepenny-piece, I place a gun-wad between the radium and growth, also protected with rubber tissue; and, should the growth to be treated be larger, I put more packing. This not only extends the time for the application, but also the area radiated, as you know the intensification of the radiation varies inversely to the square of the distance. So much for superficial applications. But in the case of deeper-seated cases—and the superficial skin intact—I then use my lead or silver screen without the pad, so as to obtain its maximum strength by being more approximate to the growth, but at the same time protecting the skin by cutting off the soft rays.

The first applicator I bought was about £20 for 5 mg., being about £4 per mg.; now the price is £125 for the same quantity. It was then put in small cups protected with aluminium, and surrounded with a heavy lead shield with a cumbersome handle. It was not long before I noticed the aluminium undergoing a change, and the action of the radium was so severe that it reduced it to a powder. The aluminium was discarded and mica substituted, which has kept intact ever since, and the radium that was mounted in glass tubes in time discoloured the glass a purplish tint.

Most of the applicators nowadays are spread on a varnished surface of metal or linen, instead of the pure radium bromide in cups covered with mica. The advantage the varnished surface has over the powdered form is obvious for various reasons. In the first place you have the radium spread over an even surface, and it is immaterial in what position it is held; but it is not so with the older form, inasmuch as, if a patient is holding the radium on the face, the radium would naturally gravitate to the most dependent part, and there would be the action, and the upper part would receive practically nothing.

Secondly, a much smaller quantity of radium is required when it is set in varnish. It is more easily kept clean, and its application is easier, especially in passages, viz., ear, nose, throat, cervix uteri, &c.

Amidst all the bewildering developments of electricity within the last decade, the general physician and surgeon look to the specialist, and ask: "What shall I employ in this case—X-rays, radium, Fin-sen light, ionic medication, or the newer application of diathermy?"

I am afraid no hard-and-fast rule can at present be formulated. Experience alone, which brings an intuition impossible to convey by reasoning, suggests that in this case X-rays, or in that some other

procedure, will give the best result. Naturally the operator will lean to that with which he is most familiar; but I have obtained success with ionic medication and Finsen light when the X-rays and radium have led to no improvement, either in my own or in other hands. A practical point of importance in ionic medication is that, after the electrodes are in position, the current must be applied and reduced gradually, or the patient experiences an unpleasant shock.

The Finsen light has proved very successful in my hands in a case of long-standing alopecia areata, and also in cases of ring-worm; but I use the heat rays in combination with the chemical rays. (My views on the relationship between the dermatitis produced by heat and light rays, and that of X-rays dermatitis, have been already laid before Congress, and will be found in the last volume of transactions.) It is likewise sometimes beneficial to employ more than one method upon the same case.

In 1907 I was in serious trouble with keratosis on my own hand, the result of X-ray dermatitis. I had had a partial amputation, and desired no further surgery. Having used radium successfully in so-called senile keratosis, which is, in my opinion, nothing but a chronic solar dermatitis, allied to that of X-rays, and which becomes malignant if left alone, I was led to try radium on my own X-ray keratosis, with a most successful result.

Radium appears to have a great future for the ophthalmologist. Many cases of intractable chronic inflammation can be successfully dealt with by radium, and such conditions as pannus may be benefited.

In 1903, I published a case of lupus vulgaris, in which a girl recovered the sight of an eye by removal of pannus with X-rays. Recently I have treated a boy, totally blind from pannus due to trachoma in both eyes, with radium. Five mg. was applied weekly for ten minutes to the cornea, protected by sterilised rubber tissue. An occasional conjunctival reaction soon quieted under rest and boric lotion. The right eye has cleared, with the exception of a small scar, and he can read with it. The left has considerably improved. The right eye was under treatment for ten months, and the left for six months. Mackenzie Davidson, in particular, is enthusiastic about the value of radium in ophthalmic work. In his presidential address in Section of Radiology, B.M.A. annual meeting in 1909, he said: I feel sure that radium will take a high place in ophthalmic therapeutics."

The public, and a great section of the medical profession, are still looking to us with the eager question, "Is radium a cure for cancer?"

When the question is put in that particular way, and with that general meaning, it will be better, I think, to answer "No," without hesitation; but we know that certain varieties of cancerous growth will retrogress and disappear under the influence of radium and of X-rays, and remain, to all appearance, cured.

Sufficient evidence has now accumulated to suggest that if radium could be obtained in sufficient quantities we might be able to influence large and deep-seated malignant growths in the same way that we are now able to deal with those that are small and superficially situated. I am not now alluding to rodent ulcer, about

which there is little difference of opinion, but of that larger manifestation of malignancy which goes under the generic heading of cancer. But, in the absence of such supplies of radium, I think we may lay it down as true at the present time that radium or any other form of electrical treatment cannot supplant surgical operation in the treatment of cancer. Then we may ask, "Is their action to be confined only to inoperable or post-operative conditions?" Here, it seems to me, we can put in a claim for respect. Mr. Mansell Moullin, in a recent (May, 1911) address, before the Rontgen Society, entitled "The Treatment of Malignant Growth by Radium," said:—"On the other hand, it (radium) is of the greatest value in what may be called the pre-malignant stage—that is to say, in removing growths which not infrequently become malignant as age advances, without an operation, and, what is very important, not merely for cosmetic but for clinical reasons, without leaving a scar."

I would go further than Mr. Moullin, for I believe there is an advantage in pre-operative irradiation of a growth, even when it has become malignant. Post-operative irradiation will prevent local recurrences, but it cannot affect metastases. I am of opinion, however, that post-operative irradiation should be applied in every case where possible, and that pre-operative irradiation appears to lessen tumorous vascularity, and may also possibly tend to prevent subsequent recurrences.

Finzi (Lancet, May, 1911), from an experience of 100 cases, concludes, among other points, that "prophylactic treatment should be used after every operation for cancer."

It may be asked, "What is the advantage of radium over X-rays?" So far as we are on certain ground, radium has the advantage of portability and of facility of application to particular regions. X-rays have the advantage of covering a greater area and are more useful in sloughing areas. Standing on rather uncertain ground, we may also say that radium appears to have a greater selective action than X-rays, remembering always that "selective action" is a theoretical term.

To confine the application of radium solely to inoperable cases seems quite unfair and unreasonable, since such cases are usually inoperable owing to the extent of the growth and its metastases, a condition under which no treatment would be likely to do more than prolong life.

C. I. Morton, of Guy's Hospital (B.M.J., 25th February, 1911), says:—"Apart from the question of the action of radium, there is one point of practical importance which deserves attention. It is that in the cases in which radium acts beneficially it acts at once. . . . If no improvement is apparent in this time (fourteen days) further treatment is useless, except, perhaps, for its palliative effect."

With regard to this statement I agree with the general principle, but I think Morton rather understates the time. I should be disposed to allow at least a month before concluding that radium was ineffectual.

In this short address I have purposely kept to the general observation, because, in the work of the Section now to begin, we shall enter upon the specific details.

In conclusion, I would say that it is to Sydney we shall look for guidance on a great many of these points with respect to radium. The Sydney Hospital, with its radium equipment, stands second to none in the world, and its message to the world within the next few years must be one that will largely influence our opinion and aid and strengthen our practice.

In all the applications of electricity and radiotherapy to medicine we are still on the edge of the unknown. If we are to proceed safely it is necessary that our observations and experiences shall be honestly stated. Nothing ought to be extenuated, and, at the same time, nothing set down in malice. A simple statement of facts may be all that is possible for a generation. Then a genius comes along and gathers up the isolated facts into a great generalisation of truth, and a new step forward into the unknown universe is safely planted. And if we are sure of our facts we can afford to be patient with those who receive our statements with a shrug of the shoulders or a sceptic smile, and point them to Hamlet's remark to Horatio:—

There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy.

NOTES ON SEVEN YEARS' EXPERIENCE OF THE VALUE OF X RAY AND ELECTRO THERAPEUTICS.

By STANLEY ARGYLE, M.B., M.R.C.S.

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HAVING now had practically seven years' experience of electrotherapy after twelve years of general practice, it seemed to me to be desirable to review my notes of cases in order to ascertain to what extent my results agreed with the recognised authorities, in what class of cases I had been most successful, what were my failures, and, if possible, why I had failed. It also might be of value to ascertain in what diseases, if any, electro-therapeutic measures were superior to ordinary medical and surgical methods.

My first difficulty is that of classification. The medical electrician—if I may use a much-abused title—is almost entirely dependent upon his professional brethren for the great majority of the cases which come to him for treatment.

The views of the profession generally as to the class of case which may be handed over to the electrical specialist for treatment are, to say the least, extraordinary. A very large proportion of cases may be fairly classed as "forlorn hopes." Cases which have resisted almost every known drug in the pharmacopœia, inoperable malignant growths, and chronics of all descriptions are cheerfully passed on to the radiologist or electrician, with the idea that either one or the other may work a miracle, or in order that the patient may think that some effort is being made to cure him.

Other practitioners, chiefly surgeons, are quite convinced that the only value of electrical methods in the cure of disease is the psychic impression that the procedure may have upon the mind of the patient; or, in other words, that all results obtained by electro or radio therapy are suggestive in origin.

Very many cases which would respond rapidly and with certainty to electricity never reach the electrician until older, slower, and less certain modes of treatment have been exhausted.

A case of chronic rheumatism with fibrous ankylosis of the knee joints was treated in hospital for four months without the slightest response to the numerous drugs which were poured into his long-suffering alimentary canal. He was completely bed-ridden, unable to stand, let alone walk. Three weeks of treatment by ionic medication saw him leave the hospital erect, and walking briskly. The result of all this is that a very great variety of cases come within the scope of electro-therapeutics, and it is almost a *sine quâ non* that the medical electrician should have had a fairly wide previous experience of general practice. He is often asked for a diagnosis as well as treatment in many obscure cases in neurology, dermatology, gynæcology, medicine, and surgery. Time and again I have been asked to treat alleged cases of rodent ulcer, lupus, or ringworm, which have proved, on careful investigation, to be local manifestations of specific disease. An obstinate neurasthenia turned out to be incipient general paralysis; a lumbago of some months' standing was due to renal calculus; and a sciatica under the searchlight of the X-rays was revealed as a mono-articular rheumatoid arthritis.

I do not desire to dwell upon this point, but these examples at least serve to point out the futility of entrusting electrical treatment to half-trained masseurs, nurses, and lay electricians.

Broadly speaking, all cases which require electrical or X-ray treatment may be divided into two classes.

First, those cases in which constitutional effects are required; and secondly, those where local treatment is the sole end in view.

In the first division the principal diseases which I have had to deal with, placed in their order of frequency, are:—Neurasthenia and nervous irritability, insomnia, rheumatism, rheumatoid arthritis, and a few spinal cases, such as progressive muscular atrophy, paralysis agitans. I have not as yet attempted to treat such general conditions as phthisis, believing that older and more suitable methods, such as are usual in most sanatoria, should be resorted to without wasting precious time in the contaminated atmosphere of a great city with such problematical measures as X-rays, high-frequency currents, or static electricity. I am, however, firmly convinced that many cases of early phthisis would derive great benefit from electrical treatment, in addition to the ordinary routine methods adopted at the sanatorium.

I have no experience of the value of electricity in diabetes, but judging from my experience of the effects of static charging in influencing metabolism, in other cases where there is some perversion of the normal cellular activity, I should be inclined to think that

good results might be obtained if it were used in conjunction with a proper dietetic régime in carefully-selected cases; in particular, the cases which occur in the later years of life.

That static electricity and high-frequency currents have a decided effect upon blood-pressure I am quite satisfied. For some time I made careful examination of the state of the blood-pressure in all cases that I had to treat by static methods for any purpose whatever. I found that a decided fall in blood-pressure occurred in all cases, amounting, on an average, from 5 mm. to 10 mm. of hg. I have never been able to satisfy myself, however, that the reduction obtained was of any permanency. With high-frequency currents I believe the results are of a more lasting character; but it must be obvious that where definite changes have occurred in the arterial walls, no such effect could possibly be lasting.

In neurasthenia I have found electricity in the form of static charging to be of very great service. Practically every case that has come under my care has derived very great benefit, the rapidity of the improvement often being quite startling in character. Cases which have refused to respond to all manner of drug treatment, to rest cures, to general massage, long sea voyages, mountain air, and repeated change of environment, have steadily improved almost from the first day of treatment until, after a few weeks, what may fairly be termed a symptomatic cure has been obtained.

As far as I have been able to ascertain, the results in these cases have been permanent, except, of course, in a few particular instances where some definite cause for the condition exists, such as domestic unhappiness, financial worry, or overwork. Under the tonic influence of the static current insomnia steadily departs, nervous irritability and depression clear up, digestion improves, the colour returns to the pasty complexion, headaches are a thing of the past, and the whole physical condition of the patient improves out of all recognition. I am convinced that there is no general tonic for the nervous system which can be compared for the moment with the static current, if one may use such a contradiction in terms.

One case that amongst many stands clearly out as a remarkable result of this method may perhaps be referred to in detail. A lady, aged 34, married, a neurasthenic of many years' standing, was operated on in London by several surgeons, the operations including a gastro-enterostomy, double ovariectomy, and appendicostomy, failed to improve her general condition, and she was despatched to Australia to see whether the sea voyage and change would effect any improvement. No benefit resulted from the voyage, and she remained in Victoria in one of the most bracing country districts for several months without emerging from her condition of confirmed invalidism. She was weak and feeble to a degree, suffered from persistent insomnia, with headache, anorexia, and constant abdominal pain and discomfort. She was practically confined to her room, being quite unable to walk any distance at all without great fatigue. Her complexion was sallow, she was extremely emaciated, and the whole clinical picture was, to say the least of it, alarming.

She was driven to my consulting room daily, and assisted on to the platform of the static machine, where she received treatment for from half to three-quarters of an hour. Within a week she declared that she was feeling decidedly better, the insomnia had left her, and her appetite and digestion were improved. In fourteen days she was able to walk from her hotel to my rooms, her colour had improved greatly, and she was herself quite delighted with herself. Within three weeks from the commencement of her treatment she left Australia for England, feeling and looking an entirely different person.

I received a letter from her, written from Colombo, to say that the improvement had been maintained; and six months later I heard from her husband that, although still somewhat delicate, she had never relapsed into anything like her original condition of hopeless and helpless invalidism.

I am inclined to think that the explanation of the benefit that these cases obtain from the static current is entirely due to the increased cellular activity that is set up, not only in the nervous system, but practically throughout the whole body. So that instead of the "vicious circle" which is so familiar to us, by which one organ reacts upon another until the whole system is upset, we have what I may perhaps be permitted to describe as a beneficent circle, in which the whole process is reversed. Each organ receiving its stimulus acts and interacts with the rest of the system for the general good.

The machine that I use is a Wimshurst, with eight revolving plates of 3 feet in diameter, and its tonic effect is best obtained by employing the method usually described as "potential alternation," a variety of wave-current by which the patient is alternately charged to a high potential, and then suddenly discharged by means of an earth chain at the rate of about 100 discharges to the minute.

Rheumatism in all its forms is particularly amenable to treatment by electricity, either by static sparks, constant current baths, or by ionic medication.

I have found all forms of muscular rheumatism respond readily to static methods, while arthritic conditions are best dealt with by ionisation, assisted by the tonic effects of the static current.

In rheumatoid arthritis, even of old standing, considerable relief may be expected from the use of the ions of salicylic acid, lithium, and iodine.

In one case in which, although comparatively recent in origin, the course of the disease had been steadily downwards until the patient was almost crippled in both hands and feet, a regular course of treatment by these methods, extending over about six months, resulted in a complete cure. This patient has now reported herself to me at regular intervals for four years, and up to the present, beyond occasional slight attacks of stiffness in the larger joints, has had no recurrence of the disease. These slight attacks have invariably responded to a few days' treatment by the static method, the general health being excellent. At the commencement of the treatment the hands and feet were so enlarged that special boots

and gloves had to be worn, and the wedding ring removed from the finger. At the present time the original size in boots and gloves are worn, and the wedding ring is easily slipped over the knuckles.

In other cases of longer standing, and possibly due to a different cause, the results were not so happy, but in the great majority of cases treated there has been a decided and marked improvement in the condition of the joints involved. It has been my invariable custom to make an X-ray examination of all cases before treatment is commenced, in order to arrive at a clear knowledge of the extent of the mischief, so that one's efforts may not be wasted on a fruitless endeavour to remedy an already hopeless joint.

I am not satisfied in rheumatoid arthritis with local ionisation applied only to the joints affected. It is very desirable to endeavour to influence the general health and to build up the resistance of the patient by means of static electricity, as well as by liberal diet, exercise, and massage.

The value of ionic medication in chronic rheumatism, particularly in cases with stiffened joints, is considerable. I find that these cases respond rapidly to a course of chlorine ions, especially if the treatment is combined with a preliminary application of radiant heat.

In cases where pain is a predominant feature I find that the salicylic ions give almost immediate relief.

In chronic gout, where arthritic conditions cause lameness, combined treatment with the ions of lithium and salicylic acid has given me very satisfactory results, the relief obtained being of a very lasting character.

A military officer who had been incapacitated from marching by the condition of his ankles, assured me two years later that the results of treatment in his case had been most satisfactory, as not only did he obtain relief at the time, but had had no recurrence of the trouble since.

An old sportsman with a very athletic past, proposed to solace his declining years by indulging in a daily game of golf. Unfortunately, he found that after he had completed two or three holes on the links the gouty condition of his feet prevented him from proceeding, and he was compelled to hobble back to the pavilion in the frame of mind and using the language which is usually associated both with golf and with the gouty condition. Three weeks of lithium and salicylic ions, however, enabled him to accomplish the journey round the links with comfort, if not with ease, and he is now an enthusiastic exponent of the new electricity.

It is claimed for static electricity that it increases the elimination of solids by the urine, and the clinical results I have obtained certainly confirm this view. The treatment of such diseases as rheumatism and gout by the two methods of local ionic medication and constitutional static charging seems to me to be both rational and scientific.

In organic diseases of the nervous system one cannot hope to do much more than to improve the general health, and perhaps check

the course of progressive disease by increasing the systemic resistance, and in such conditions as amyotrophic lateral sclerosis and other spinal atrophies, to keep up the tone of the unaffected muscles and muscular fibres to enable the patient to get a little more use out of his disabled limbs. One case of which I have notes shows that in such cases some relief can be obtained from electrical treatment, even when all else has failed.

A patient in a fairly advanced state of progressive muscular atrophy was bedridden, unable to walk, barely able to stand, could not sit up or turn over in bed without assistance, and was in a deplorable condition from general eczema. His case had been pronounced incurable by several specialists, and his family doctor naturally concluded that nothing could be done except to wait patiently for the end. He was brought to me and carried into my consulting room for electrical treatment. This I gave him in the form of static charging with sparks to the spine. He improved rapidly up to a certain point, so that he was able to walk unaided, could feed himself, put on his own hat, and sit up with ease. His eczema cleared right up, but beyond this the improvement did not go. He discontinued treatment, and a few months later began to go downhill again, and finally died from pneumonia.

In such conditions as paralysis agitans and locomotor ataxia my experience has not been at all favourable to electrical methods, except in so far as the general health may be improved in spite of the disease.

Amongst the many local conditions requiring treatment by electrical methods, naturally a large number of skin cases find their way to the electro-therapeutist. Amongst these may be mentioned epithelioma lupus, lupus erythematosus, rodent ulcer, eczema (chronic), ringworm, sycosis, hypertrichosis, alopecia areata, cheloid and hypertrophic scar, nævus, and pruritus.

The treatment of true epitheliomata by X-rays has not been in my hands at all satisfactory, except as a post-operative measure to prevent recurrence. I invariably send all epitheliomatous conditions to the surgeon for operation, and as soon as the wound has healed give a series of X-ray exposures at intervals for about three months.

My experience has been that the great majority of these do not recur.

With regard to lupus, my experience is strictly limited, as the disease does not appear to be very common in Victoria; but the few cases that I have been called upon to treat have done very well under X-rays, with the exception of one case, which healed very well except a small patch on the labio-nasal fold, which was very obstinate, and finally took on an epitheliomatous appearance, and had to be excised. I do not know if any recurrence took place. Lupus erythematosus is not, as a rule, suitable for X-ray treatment, which must in such cases be applied much more carefully and in smaller doses than in true lupus, in order to avoid too severe a reaction.

In rodent ulcer I find that the zinc ionisation method is the most satisfactory in the great majority of cases.

Where the surface of the ulcer is at all extensive I use X-rays.

It is quite surprising the rapidity with which the raw ulcerating sore heals over under the influence of the zinc ions. Of fifty cases of rodent ulcer of which I have notes, nineteen may be classed as cures, fourteen were greatly improved, but evidence of the activity of the disease was still discernible; four were failures—the condition either failed to respond to the treatment or broke down absolutely at a later stage; five abandoned the treatment for different reasons; and eight are still under treatment at the present time. Of the nineteen so-called cures, various periods of time have elapsed since the last treatment; in some of them several years without any sign of recurrence, in others only a few months; and it is quite possible that they may at a later date show signs of activity and require further treatment. One case amongst the eight still under treatment remained perfectly healthy for over two years, and then broke down rapidly during a period of general ill-health. This case was a shallow ulcer of the concha of the ear of nine years' duration. Amongst the cases which were improved by this method of treatment are several in which the disease is quite under control, but where nodules put in an appearance from time to time, and require a fresh application of the ions to cause them to disappear.

One of these has been under observation now for three years. The ulcer was a small one on the naso-labial fold, and was of three years' duration. It healed completely under treatment, and has remained so except for the occasional appearance of small, scaly scabs about the size of a pin's head. These respond at once to a single treatment, but four or five months later reappear.

I tried the effect of an application of radium upon this case, but without effect.

In another case the ulcer healed, but the margins of the scar looked unhealthy. A short application of radium removed this, leaving a clean surface behind, on which I was unable to detect the slightest evidence of activity.

When it is taken into consideration that some of these cases were of exceptional severity, of many years' standing, and on patients of a great age, whose resistance might be classed almost as a minus quantity, I am satisfied that in zinc ionisation we have a reliable method of treatment for this distressing and unsightly condition, which in many cases is permanent, and may be expected in nearly all to greatly improve the appearance of the lesion. It is possible that by some improvement in the technique, or by using the method in conjunction with radium or filtered X-rays, still more favourable results may be obtained in the future. Before passing on I should say that cases of rodent ulcer in which deep structures are involved, particularly bone and cartilage, do not appear to respond well to any known method of treatment; amongst my failures were two of these, one involving the frontal sinuses and the other the cartilages of the ear.

In chronic eczema, ringworm, and sycosis, I have used the X-rays according to the method of Sabouraud and Noire, with the usual results.

In hypertrichosis I have lately been following the technique of Bordier, of Lyons. His chromo-radiometer is similar to that of Sabouraud, with the exception that the pastilles are placed directly upon the skin, and that his colour scale gives four different degrees of dosage, according to the effect required to be produced. The unsatisfactory state of the X-ray method in the treatment of hypertrichosis was such that most of the authorities had practically decided to abandon the method except in extreme cases. The risks attending its use were too great for most men to attempt to remedy a slight unsightliness by a method which might ultimately produce a deformity even worse than the original condition.

Bordier introduces an aluminium filter, 4·5 millimetre in thickness, between the source of the rays and the skin of the patient. He places his pastille on the skin, and gives an exposure of sufficient intensity to produce his tint O on three alternate days. He then claims that the great majority of the hair will then fall out permanently without the production of any skin reaction.

I have modified this procedure to the extent that I endeavour to produce Bordier's tint I in three separate exposures—that is to say, the aggregate dose of three exposures, given on alternate days, is required to produce the second colour in Bordier's scale. A tube with a penetration of seven on the Wehnelt radiometer is required; a softer tube will fail completely to produce epilation.

In from ten to fourteen days after such a series of exposures the hair falls more or less completely, without any noticeable skin reaction beyond a little itching, and in some cases a slight degree of pigmentation. In about six weeks the hair begins to grow again, but with less vigour than before, and a second series of exposures is given. The hair now takes longer to reappear, and requires a smaller X-ray dose to again produce epilation, until in about twelve months from the first treatment little or no hair will grow at all.

Beyond a little evidence of atrophy as shown by wrinkling, the skin does not appear to have been at all injured by the treatment. Up to date none of my patients have shown any evidence of telangiectasis or permanent pigmentation.

Cheloid and hypertrophic scar appear to be favourably influenced by X-ray treatment, but I am inclined to favour chlorine ionisation in the latter condition.

In the electrical treatment of nævi I find the most satisfactory results are usually obtained from the old-fashioned method of electrolysis, except on widespread superficial nævi, where possibly the X-rays or radium may be more efficacious and less tedious in application.

Turning to the treatment of malignant disease by the X-rays, I am absolutely convinced that it is a dangerous waste of time to primarily treat either carcinoma or sarcoma by Röntgenisation. As an adjunct to surgical procedure, both before and after operation, I have had most satisfactory results. Many cases of carcinoma of the breast have been submitted to post-operative X-ray treatment and recurrence has been the exception in a fairly large number of cases.

I make it a rule that all cases so treated should report themselves to me at least every three months. In the great majority of cases that have come under my care this has been done, and, as I say, recurrence is the exception. Unfortunately, one occasionally gets cases which have gone too far before operative measures were undertaken, and metastases or recurrence occur to spoil an otherwise good run of cases.

The introduction of the method of filtration of the X-rays with a view to save the skin and superficial tissues from the massive dose required in such cases may produce better results, but I must confess to a feeling of pessimism in regard to the view that in the X-rays we possess a possible cure for cancer.

It is, of course, quite impossible to say to what extent the X-rays are responsible for non-recurrence in post-operative cases. A very long series of cases would be required to see if the statistics were improved, as against the percentages in cases where the X-rays had not been used.

As far as my experience goes, however, I have been distinctly impressed with the results in such cases, and would like to see all cases of carcinoma which are operable submitted to X-ray treatment as a routine procedure.

In the treatment of enlarged tubercular glands by the X-rays in post-operative cases, and in those in which no operative measures have been used, I have been uniformly successful. In all the long list of conditions amenable to X-ray treatment, I think I may say that the treatment of enlarged glands is the most satisfactory.

In some instances the treatment has been combined with the vaccine method, but whether this has been used or not the enlarged glands have practically disappeared after a longer or shorter period of radiation.

The use of the aluminium filter has enabled me to give much larger doses without injury to the skin than I could otherwise have administered.

In Hodgkins' disease, on the contrary, my experience with X-rays has been disappointing. A very marked reduction in the glandular enlargements occurs in nearly all cases, but the progress of the disease is unaltered, or very slightly checked.

In the treatment of gynæcological conditions my experience has not been sufficient to permit me to generalise with any confidence, but in the few cases that I have been called upon to treat, the results have been, to say the least of it, encouraging. Cases of dysmenorrhœa and endometritis have decidedly improved under galvanism, either intra-vaginal or intra-uterine, while chronic leucorrhœa has been materially benefited by the intra-uterine applications of metallic zinc and copper electrodes.

In the hands of the gynæcologist these methods seem to me to be capable of more certain and lasting effects than many of the surgical procedures now in vogue.

The rapid healing which occurs when zinc ions are introduced into the tissues in all sluggish ulcerative conditions of the skin and

mucous membranes of the mouth and nose makes me of opinion that similar methods should succeed when applied to the cervix uteri or diseased uterine mucosa.

In the treatment of local neurites, such as sciatica, brachial neuritis, tic-douloureux, and other peripheral nerve lesions, I have found the use of sahcylic ionisation very efficacious, especially when used in conjunction with static electricity. In a case of neuritis of the musculo-spiral nerve of 'several years' standing, in which there was palpable thickening of the nerve in the musculo-spiral groove, and which had resisted all drug treatment, a complete cure was effected after four months' treatment by ionisation and the static current alternately applied.

Few people who have not actually seen it can actually realise the wonderful analgesic effect of the static brush discharge applied to painful nerves which are sufficiently near the surface to be got at.

I have seen a patient in agonies of pain from pressure beneath a gold-crowned tooth entirely freed from all pain in fifteen minutes by the use of the static current.

In sciatica I have seen a patient barely able to hobble, and quite unable to assume the ordinary sitting posture, walk briskly round the room after half an hour's treatment on the insulated platform of the static machine. These are cases, of course, where there is a definite chemical or organic cause for the neuritic pain, such as alcohol or pressure upon the nerve trunk within the pelvis. It is not to be expected, therefore, that all cases will respond to electrical treatment; but the failure to produce any improvement in the condition should always, in my opinion, be taken as a *primâ facie* evidence of a deeper-seated cause of the trouble than has been apparent from the first examination.

There are many other conditions in which I have found electrical methods of very great benefit where ordinary medical and surgical treatment has failed; but they are difficult to classify, and my experience has not been sufficiently extensive for me to take up your time with any reference to them.

In conclusion, I desire to emphasise:—

- (a) The great value of the ionisation method where local treatment is required, and to suggest that much ground is still unbroken, both with regard to the kind of ions to be used and the varieties of lesions to which they may be applied.
- (b) The enormous value of post-operative treatment in malignant disease by the X-rays.
- (c) The use of the static machine in all cases of debility, from whatever cause produced.

Finally, I desire to express the hope that as the science of electrotherapeutics has, after many years, been rescued from the hands of the quack and the charlatan, it may in the future proceed hand in hand with its elder sisters, medicine and surgery, to the greater credit of our profession and the benefit of suffering humanity.

DISCUSSION.

Dr. LAWRENCE: I would like to congratulate Dr. Argyle on his paper; it is one of the most interesting papers that have been brought before the Section. Dr. Argyle has given a great deal of attention to the subject, and has had the advantage of being in general practice, and, as he mentions in his paper, he thinks it necessary for a person taking up skiagraphy, to have been previously in general practice. In the future I am afraid it will not be the general rule; but I think it would be wise to take up general medicine first, and then go in for specialism later. In the case of skiagraphy it is really most essential and necessary. I had no idea skiagraphy was really such an advanced subject. General practitioners ought to know of the advances made, as shown in the papers read here.

In the matter of diagnosis, &c., I have not taken this up to any extent, but I can see the amount of work involved in skiagraphy is very great indeed.

As regards the treatment of hypertrichosis, I am very pleased to hear of Dr. Argyle's success with the rays, and that you can really get a good result.

Before going to the Congress in New York I thought of reading a paper on the treatment of hypertrichosis by electrolysis. I think I was the first to do it in Australia, but that was about twenty-two years ago. What I did, I used the X-rays—that is, in 1907—and gave them a few mild exposures, and when the hair-bulb is ready to fall the whole thing is contracted; you get your needle right on to the root.

Dr. STRANGMAN: I have listened with very great pleasure to the reading of this paper. I am personally indebted to Dr. Argyle. Some time ago I visited his clinic; at that time I was to a great extent groping in the dark, and he put me on the right track, and since then I have had some very interesting experiences. Dr. Argyle mentioned a very great many uses for ionisation. I owe my start to Dr. Argyle.

One thing I can mention: the treatment of boils in my district. For these I have used chlorine ions with very great success.

I have had a case, a man working at a saw-mill, and he had his fingers injured. One finger stood straight up, and was turned over on top of the other fingers. He came to me to have the finger removed; the finger was always in the way. Of course I used ionisation.

Another treatment I have adopted—I saw Dr. Argyle use it—is in connection with ringworm. The case I am thinking of was a very obstinate case; we tried all sorts of things, acids, &c.; but when we used the copper ion it was cured, and has not returned since.

Dr. MOLESWORTH: I would like to ask Dr. Argyle for a little information in regard to this matter of dealing with hypertrichosis. I have heard of the method, but I have never practised it, for I have been afraid of making the case very much worse by using the rays on the face, and possibly causing atrophic changes in the skin. I

should like to know how the dose which he uses compares with the ordinary epilation dose of Sabourand. From the history I should imagine it would probably amount to very nearly the full dose, and, if so, it would be easier to use a Sabourand pastille. With regard to the effects of the treatment, might I ask whether, in cases in which it has been tried, the result has been observed after the lapse of six or twelve months?

I should like to thank Dr. Argyle for the very instructive paper, referring especially to the part on electrical therapeutics. This subject is very much more advanced than a lot of men in the profession know. I myself did not know as much of the advances made as I should like; if the general practitioner really understood what great help can be afforded they would avail themselves of it, very much to their own advantage and to that of their patients.

Dr. HARRIS: I would like to thank Dr. Argyle for his very excellent paper. Victoria ought to be very proud of possessing so conscientious and scientific a man as Dr. Argyle.

As far as static electricity and high-frequency are concerned, I have not had a very great deal to do with either. I am quite certain the results given by Dr. Argyle are all that he claims them to be.

As to ionisation, some years ago I had books sent to me by the authors, and I carried out a number of experiments at the Sydney Hospital. I remember one case that was sent on to the department as rodent ulcer of the face. It turned out to be a case of specific ulceration. The curious thing was that after treatment we found these so-called rodent ulcers on the forehead healed up; but there were others on the face which developed subsequently. I left off the ionic treatment, and put the patient under specific treatment, and all these cleared up. My results with rodent ulcers were not very satisfactory. I found out that they would heal to a great extent, but then there would be little nodules left; I subsequently found that it was necessary for the surface to be absolutely smooth to carry out this treatment. I then always curetted the part, and used to get the electrode perfectly flat on to the lesion. My conclusion is that this is the great secret of success in treating these cases by ionisation, viz., that there must be absolute contact between the lesion and the electrode.

I have often treated cases by means of silver ions. One case concerned a man in a very important position. It was a case of leucoplakia of the tongue. He was carrying on correspondence with Professor Leduc, of Paris, and he got full instructions how to carry out the process. I employed this silver ionisation with a moderate amount of success.

In cases of tic douloureux I have used zinc ions. One was a very successful case in a lady some little time ago. She was suffering from neuralgia of the auriculo-temporal nerve, and it gave her a great deal of trouble and pain. After one application she told me that for the first time for many months she could eat her breakfast without suffering any discomfort whatsoever.

I again wish to thank Dr. Argyle for his excellent paper.

Dr. CLENDINNEN: I wish to compliment Dr. Argyle on his very valuable and interesting paper. I think the time has arrived now that this branch of electro-therapeutics and medical electricity should be included in the medical curriculum. It seems impossible to include any new subjects, but this branch has got to such a stage now that it is a most important subject, and it should be in the curriculum of a medical student. Some medical men do not know about it, or understand it thoroughly.

I would like to ask Dr. Argyle, in treating cases with static electricity, if he noticed any effect on the circulating system. High-frequency is most useful in reducing high blood-pressure, and also in cases of people suffering from headache, especially during the climateric period.

Dr. ARGYLE, in reply: There are a good number of the things referred to by speakers in the paper, so I will not go into details. I certainly use ionic anæsthæsia. I find it very necessary to use this if the heart is not too strong. I invariably put on a small pad, soaked in cocaine and adrenalin, for about five minutes. The effect is that the patient can stand the operation without feeling any pain.

With regard to Dr. Molesworth's remarks, in reference to the dosage in hypertrichosis. I place a pastille on the skin on the other side of the screen, so that it receives a filtered dose, and the epilation dose of filtered rays is a little above Sabouraud's epilation dose. The case I was working on was a hospital one. Dr. Harris said he took heroic measure; I do not do so, but go very carefully, and get good results. I am not going to risk my reputation by trying anything unwise. As to results, I am not in a position to state whether these cases will develop any telangiectases. I can only say that the time has been fairly long, in some cases over twelve months, and in others sometimes less.

With regard to Dr. Harris, as to the use of ions, I quite agree with him. I do not say that the ionic method is the best; I only know that it has been very satisfactory in a large number of cases. And again, I agree with him that regular pressure is of paramount importance.

Dr. Clendinnen did not notice it, but in my paper I referred to the effect of the static current on the blood-pressure.

He is also right—the value of the electric treatment for headaches, especially post-menstrual, is very great indeed. In all cases I have had of that description they have been entirely satisfactory.

RADIUM.

By HERSCHEL HARRIS, M.B., C.M. (Syd.).

Late Assistant Surgeon, Sydney Hospital ; Hon. Skiagrapher, Royal Prince Alfred Hospital, Sydney Hospital, Royal Alexandra Hospital for Children, and Dental Hospital.

IT is not my intention to enter fully into the question of radium, as the Sydney press have already grappled with the subject, published interviews with certain medical men, and even illustrated their apparatus and so-called cancer cures *ad nauseam*.

For some time now, in conjunction with Dr. Frank Bennett, a number of varied cases have presented themselves for treatment. Some have been suitable, and responded well to treatment; others have been unsuitable, and have not responded.

To be brief, the late malignant cases have not done well.

The early epitheliomata have done well in many cases.

In some few cases the radium seems to have accelerated their growth, and in others, whilst the original focus has been apparently cured, secondary involvement of glands has followed subsequently.

Rodent ulcers have been most responsive. Unfortunately, these are often referred to as pure epitheliomata; hence the statistics become muddled. There is certainly a narrow line of demarcation between the two, but I think we all admit that one is of much slower growth, and more benign, than the other. Nævi of various kinds have yielded almost remarkable results.

I must candidly admit that this treatment is, *par excellence*, the one to be recommended in such cases.

The resulting scars are smooth and natural-looking, provided treatment has not been overdone.

Pigmented moles, with and without hairs, have also done well. These cases require prolonged treatment, extending over some months.

Several cases of leucoplakia, and one in particular, which was greatly thickened with a warty excrescence on its surface, have cleared up in a remarkable manner.

One case, which presented all the appearances of an epithelioma of the lower lip, has remained well now for twelve months. It was not examined microscopically, and so I am very doubtful as to its nature. As it involved the mucous membrane, and the result has been so satisfactory, I am inclined more to the belief that it was not a true epithelioma.

And here, let me ask, how many cases said to be "cancer cured by radium," have been examined microscopically by competent pathologists?

I am afraid that most cases are just judged by their appearances alone.

Certainly it saves trouble, but the results are most confusing, and even misleading.

Scars and keloids respond well if persevered with. Filters of various sorts have been used in some of these cases, according to the nature of the disease, and "cross-fire" methods have been employed when possible.

Having had a very large experience in treating cases with the X-rays, I am not one of those to go into ecstasies over radium therapy. I look upon radium as being a pocket X-rays appliance in most cases, and certainly in cavities it is more easily applied than can be the X-rays.

At the same time I think we should be very guarded in making statements that radium will cure cancer.

Already the public have got hold of this notion from the various radium advertisements that have appeared from time to time, and I think the sooner they are disillusioned the better will it be for them and for the prestige of the profession to which we belong.

EXPERIENCES IN RADIOGRAPHY.

By CHARLES AYRES, B.A., M.B., C.M.

IN this short paper I desire briefly to relate some of my own recent experiences and observations in radiography. I have described in my paper, in the Dermatological Section, the apparatus which I employ in private and in hospital. With a gaiFFE 15-inch coil and mercury turbine interrupter I can only get 4 or 5 milliamperes through the tube practically free from inverse current, whereas with the Wehnelt interrupter and the same coil I can get 10 milliamperes through the tube, but cannot depend upon the current being free from inverse current except for a very short time. I use the sunic accelerating screen in an exposure case when raying the thicker parts of the body. This screen has practically no grain, and I find it shortens the exposure to about one-twentieth of the time necessary without it. It has been said that the screen deteriorates after about eighty exposures, and that the same screen should not be used again within two hours of a previous exposure. I have not found either of these statements true. I use the screen again soon after having made an exposure, and, so far, have not found any bad effects resulting.

For cutting out the inverse current I have tried rectifying valve tubes, but now only use a spark gap inside a large bell-jar. This, in my opinion, is equally as efficient as the valve tube, and never needs renewing. I have found, as many others have done before, that the Wehnelt break is destructive to tubes. I have tried the Burger, Bauer, Gundelach moment rohre, the ordinary Gundelach, the water-cooled Müller, Müller 13a and Müller 13. Of these I have found the Bauer and the 13a Müller the best for use with my installation, but every one of them has quickly deteriorated when used with the Wehnelt interrupter. They work better with the gaiFFE break, which, however, will not permit of such large currents being

used. There can be no doubt that large currents through the tubes are necessary, not only for chest examinations, but also for stereoscopic work; and most radiographers, I think, now require to be able to do rapid radiography, because cardiac and respiratory movements prevent good definition, and it is objectionable to keep a patient in, perhaps, an uncomfortable position for longer than is absolutely necessary. The intensified coils now in use and a good accelerating screen have greatly reduced the time of exposure. The latest coil, I understand, is the work of Professor Wilson, of King's College, London, who has introduced a coil which allows of the use of the current on making or closing the circuit instead of the current at breaking or opening the circuit, as at present. I am wondering now if this coil is to solve the radiographer's trouble, because if it will produce, as he thinks it will, a large current and no reverse, and perhaps no great amount of heat in the tube, it will be a great blessing indeed. I place the tube inside a large X-ray opaque box, and place it beneath the canvas couch, having an easy arrangement for moving it lengthwise and from side to side for use in stereoscopic radiography. I think there are advantages in taking radiograms with the tube beneath the couch—(1) Because one can readily get the required area over the most intense and direct rays from the tube, and can move the part to be examined till the best view is obtained; (2) the opening in the diaphragm over the tube can be reduced to such a size as to only just include the part required, thereby obtaining a sharper image on the plate; (3) in the case of most patients, and especially of women and children, having the tube hidden beneath the couch is preferable to having it above; (4) a calculus, if present, may be seen to move up and down with respiration, whereas shadows of pleboliths in the pelvis and of calcareous glands in the abdomen remain stationary; (5) it is easy to do stereoscopic work with the tube in this position. By means of the new Pirie stereoscope, which is in the form of a small pair of opera glasses, a stereoscopic view of the two plates, when placed side by side, can readily be obtained. This stereoscope can be carried in the pocket, and, in my opinion, is quite as satisfactory and more convenient than the large Wheatstone instrument. For the examination of the kidneys and upper portions of the ureters I prefer the prone position, with an air-pillow against the abdomen for compression, and the plate on the back. But for this examination it should always be remembered that the patient requires preparation. He should only have light diet for two days previously, and a vegetable aperient—*e.g.*, cascara sagrada—given to empty the intestines, otherwise shadows are thrown on the plate and the outlines of the kidneys will not show. Calomel, of course, should never be given, and it is better also not to give salines or enemata. Frequently, on showing a plate, with the shadow of only one kidney on it, to the surgeon he has remarked that the kidney is "dense." Recently Fenwick has said that the cause of this "dense" kidney is invariably a thickened capsule. Others says that the thickened capsule practically makes little or no difference to the shadow thrown on the plate. Their explanation is that it is a question of the relative densities of the kidney and surrounding parts as to whether or not

the shadow of the kidney is shown on the plate, and that is why it is so important that the patient should be properly prepared beforehand, as already indicated.

In making screen examinations of the patient in the upright position, it is very necessary to have the best means of protection possible, and I have recently found that it is quite necessary for me to employ lead-glass spectacles in addition to the X-ray opaque apron and gloves.

In early cases of phthisis, I think that diminished excursion of the diaphragm on the affected side is of great significance; so also is mottled shadowing. But to my mind the most important of the early signs is failure of one or other apex to brighten on deep inspiration. To get this sign I have found that it is essential, as Orton has pointed out, to—(1) Have the luminous sensibility as acute as possible by remaining in the dark for at least ten minutes, or at any rate with only a small green light in the darkened room; (2) to use soft rays; (3) to have the area barely illuminated, otherwise it is impossible to observe whether there is any difference of illumination on deep inspiration or not. I may note here that in making screen examinations of the chest and abdomen with my installation the tube heats up quickly, necessitating a number of short examinations rather than a few long ones. The use of a water-cooled tube did not seem to make much difference in this respect. In stomach cases I give a bismuth meal of 2 oz. of carbonate of bismuth in porridge, Benger's Food, or bread and milk. So far I have not found this amount of bismuth disagree. It is very interesting and highly instructive to the physician or surgeon to watch with the radiographer the shape of the stomach as thrown on to the screen. By this bismuth meal method one sees, for the first time, the shape of the normal stomach which, when empty, has its anterior and posterior surfaces practically in contact, except at the fundus, which always contains gas. Owing to the vital tonic contraction of the walls of the normal stomach, the food is kept at practically the same horizontal level—about the level of the lower end of the œsophagus—and the shape of the stomach, lying as it does mostly to the left of the middle line, has been likened to the letter J, a syphon, and a bull's horn. As more food is taken, accommodation is made for it by a widening of the stomach walls, and not by a lengthening. This can readily be seen, and physicians are surprised to find that they have not in the past accurately mapped out the shape of the stomach by percussion. It is now known that it is impossible to find out the shape of the stomach in any other way than by radioscopy after a bismuth meal. In a stomach which has lost its tone the food is not held up at practically the same level, but it falls down to the lowest part. Hour-glass contraction of the stomach, whether functional or organic, can be made out if the examination is made both in the upright and horizontal position. In functional hour-glass contraction the narrow contracted portion seems to come from the lower end of the upper wider portion of the stomach, whereas in organic it seems to come from the right side of it, and functional generally disappears when the patient is

examined in the horizontal position. Peristalsis is interfered with in cancer of the stomach, and emptying of the stomach is greatly delayed, whereas in ulcer of the stomach or duodenum peristalsis is seen to be abnormally active. Another interesting point in connection with stomach examinations, and first pointed out by Leonard, is that the stomach elongates during expiration and shortens during inspiration, but this work on the stomach and intestine is practically new, and as yet some physicians are disinclined to agree with the findings of the radiographer.

As regards the localisation of foreign bodies, I find the stereoscopic method is by far the best, showing, as it does, the exact position of the foreign body in relation to the other parts. Amongst foreign bodies which I have recently localised were a halfpenny in the œsophagus of a child 4 years of age, a penny in the pyloric canal or beginning of the duodenum in a male adult, a tack in the left bronchus, close to the left border of the heart a little above and internal to the nipple, in a boy of 7. This was an interesting case. He experienced periods of illness, with rise of temperature, necessitating confinement to bed. Then he would recover and go about again, all the time having a cough, but no hæmorrhage. About the time I had this boy under notice I read of almost an exactly similar case in an American journal, only that the tack was in the right bronchus. In that case a low tracheotomy was performed, and forceps passed down, at first blindly without result, afterwards successfully under the guidance of the X-rays. In my case no operation was performed, but fortunately one day, after a severe fit of coughing, he brought the tack up, and has been well since. The tack remained in the same position for three months. Another interesting case was that of a bullet in the vault of the skull, localised by wires placed on the skull, and, though it was successfully removed, I feel sure that the only proper way to deal with cases of this kind is by stereoscopic radiograms.

I have had several interesting cases of aneurism—one, in a woman, which I was able to diagnose from mediastinal tumour by means of the right anterior oblique examination—*i.e.*, with the tube behind and to the left, and the screen in front and to the right. In this position the normal narrow, clear central area between the vertebral column shadow on the right and the aortic arch shadow on the left is encroached upon or obliterated by the upper end of the aortic arch shadow, which in aneurism becomes club-shaped, but which normally has parallel sides and a rounded top. In another case (a man) I had some difficulty in differentiating between aneurism and mediastinal tumour, and, although I could not make out pulsation, I ultimately came to the conclusion that it was a case of aneurism.

In several cases of hydatid of the lung the outline of the cyst, especially in its lower border, showed remarkably well in the radiogram, and in one case also showed pleuritic effusion outside the unruptured hydatid cyst. Another interesting case was the fracture of the surgical neck of the humerus in a child of 7. The upper end of the lower fragment was displaced inwards, and the head of the bone was rotated outwards, so that an operation had to be performed

and a plate inserted, uniting the broken ends. The result was a very useful arm. In another case (a man of 52) the fracture of the neck of the femur showed fibrous union only. In a child of 10 a sarcoma of the upper end of the femur, with spontaneous fracture, showed the peculiar spotted appearance which results from the growth being made up of bony and soft tissue together. In gouty fingers I have seen the deposit at the sides of the phalanges; in rheumatoid arthritis the increased transradiancy at the ends of the metacarpals and phalanges, the necrotic areas in the heads of the phalanges, and the indistinct outlines of the carpal bones. In gonorrhœal arthritis the same changes are seen as in rheumatoid arthritis, with the exception of the necrotic areas. In commencing tubercular disease of the joints I have seen the blurred and indistinct outlines which make up an apparently poor radiogram. In conclusion, I may say I have had the usual experience that many fractures, with little or no displacement, would have been missed had not a satisfactory plate been obtained in addition to a screen examination.

DISCUSSION.

Dr. ARGYLE: I think one of the most valuable things in connection with a conference such as this is the opportunity for obtaining interesting ideas from one another, especially in regard to the little details of technique and other matters. After hearing the papers read we may all be able to improve our methods and do better work, and therefore I think we owe Dr. Ayres our thanks for bringing in a paper of this kind and enabling us to discuss his methods of technique.

First, with regard to the tubes. I have now given up using fancy tubes. There was a time when I was getting this and that combination of tubes. I have now come to the conclusion that it is a good idea to get a good maker of tubes, and get a uniformity of tubes, for many reasons. The principal reason is that you get to understand a certain make of tube, and when you get a new tube it may be of different shape, size, and condition; you often lose very valuable time in testing that new tube. I am now using a 13a. At the same time I cannot help feeling a little affection for a Gundelach, if you can only get a good one.

With regard to the couch, I agree with Dr. Ayres that everybody should use a canvas couch, and the tube underneath, for rapidity and for the reasons mentioned. I quite agree with him.

I do not quite follow Dr. Ayres in regard to screening for kidney troubles. I have quite abandoned the use of the screen in searching the kidney for calculus. I nearly always screen the patient from below, merely to define my field for taking the radiogram. The use of the screen in looking for stones seems to me to be unnecessary,

especially as it is always a more or less risky proceeding for the operator. Very often the stone is not visible on the screen at all, though it shows perfectly well on the plate if present.

With regard to the outline of the kidney showing on the plate, that is largely a matter of condition of the patient. As a general rule, in those cases in which you get a clear outline of the kidney it is nearly always a question of the relative density of the surrounding parts and the presence of flatus in the intestine.

We are very careful in protecting our hands, our bodies, and our eyes. Most practitioners use lead-glass in front of the screen. Well, I would urge upon every operator who uses the screen method to be very careful to see that the lead-glass in front of his screen is of good quality. It seems to me we all ought to take a little more care of our faces than we do.

Another matter in connection with this lead-glass. I heard it mentioned some little time ago by a well-known operator that the thickness of the lead-glass was of no importance.

I find that when my eyes are not ready to do screen work that I am conscious in the dark of a glare, although I can see nothing. I cannot describe it until that feeling passes off, but I do not care to make screen examinations.

With regard to pulsation in aneurism, I do not attach very much importance to it. If you do not get pulsation it does not amount to anything at all.

These are the things that occurred to me while Dr. Ayres was reading his paper. I hope many other points will be brought up in regard to this matter of technique.

Dr. EDWARDS : I would like to congratulate Dr. Ayres on his excellent paper. I would like to mention, in regard to the dark-room, I find that as I get older my eyes alter, and there is a difficulty as my eyes get worse and worse for delicate work, and I find that it is not necessary to sit in an absolutely dark room for a lengthened period, but to have a dark-green light in the room behind you. I am very much obliged to Dr. Ayres for his paper.

Dr. HERSCHEL HARRIS : I shall not occupy any time in discussing this interesting paper of Dr. Ayres', as most of the points have been dealt with in the paper I shall subsequently read.

Dr. ARGYLE : With reference to the light in the operating room, at the last Congress, in my paper on this subject, I mentioned that I used a blue light. It was suggested that I would probably get better results if I used a green light. I accepted the suggestion, and have used a green light ever since. This light was a very weak green light, and it has been very effective.

Dr. MOLESWORTH : I am not a radiographer, but in regard to the heating of the tube it rather interests me from a therapeutic view. We are always troubled very much with the heating tube. Might I suggest a water-cooled tube to prevent that heating? I do not know whether a water-cooled tube is used in radiography to any

extent, but in radio-therapy a water-cooled tube works very efficiently, and can be used with a load of 1.5 to 2 milliamperes for a quarter of an hour on end. A radiographic water-cooled tube could surely be used for five minutes with 5-10 milliamperes.

Dr. CLENDINNEN: As regards the use of the accelerating screen that Dr. Ayres referred to, of course, on using the screen again immediately after taking a skiagram there is a certain amount of latent fluorescence in the screen, but it does not last very long.

He said that overheating is bad for the tubes; but more damage is done to the tube by a reverse current. In America they use up to 60 milliamperes, or even more, but I think that the average worker out here uses up to perhaps 10 milliamperes.

As regards the below or above position of the tube, the former is best for centralisation, and also, I think, for kidney cases, as you can get better compression by means of an air pillow.

With regard to the shadow of the kidney seen sometimes on the plate, I agree that it is no doubt due to the relative density of the surrounding parts; therefore it is most important to have the patients well prepared beforehand. It is like a ship on the horizon; you can detect how many masts it has; but if it is seen against land such is not the case.

As regards protection of the eyes whilst screening, there is no doubt that it is very difficult to overcome this. With lead-glass in front of the screen you get the secondary rays given off, and they no doubt affect your eyes, and it is impossible to overcome this. My experience in radioscopy before the lead-glass came in was that I used to go home with bad headaches, and my eyes felt very sore, as if I had been reading all night; but there is a certain amount of effect due to secondary radiation through the lead-glass, and we cannot get over that.

Dr. AYRES, in reply, said that he was very glad to hear that his paper was so interesting. He wished to thank the members for their remarks and suggestions, which, he was sure, would be of great benefit to him in his future work.

SCREEN WORK IN CHEST CONDITIONS.

By E. A. STRAHAN, M.B. (Melb.).

BEFORE proceeding to the technical matter of my subject, I would like to state that I have excluded all statistics in reference to the 2,000 cases from which my remarks are made.

In the Melbourne Hospital we endeavour in all cases to obtain the full history of the cases before attempting to screen, and also combine the use of the stethoscope and palpation, where necessary, with the use of the screen.

I have endeavoured to omit all self-evident facts, and also those which are emphasised in the text-books, and to deal with the important practical observations which one makes who uses the screen frequently.

SPECIAL DISEASES.

Pleurisy with Effusion.

The usual signs in these cases, as you know, are opacity, extending upwards from the diaphragm (which is obscured), and bounded above by a vague curved line of demarcation in the upright position.

In uncomplicated pleurisy the shadow is homogenous, and its density depends on the amount of the fluid present, although the density is not as marked as that of a similar amount of purulent fluid. For this reason it is always important to try and estimate the quantity of fluid present, the best guide to which is the degree of displacement of the heart, provided the effusion has been rapidly formed. It seems to me, however, that the diagnosis is made easier by the fact that uncomplicated cases of pyothorax are rare, and where they do occur the quantity of fluid is very small—i.e., all cases of empyæma in which there is a large effusion are of the nature of pyopneumothorax; consequently, with slight displacement of the heart and rapid formation of effusion, marked homogeneous opacity indicates strongly empyæma.

In my experience, it is the rule for the lung-tissue above the fluid to be more transparent than it is on the sound side, though this is denied by Walsham and Orton.

When the pleuritic condition is complicated by lung disease underneath, it is possible to demonstrate the area of opacity underneath by the use of a tube of good penetration lowered to about 5 Beuier.

In the rare cases of doubt as to whether the condition is lung consolidation or pleuritic effusion, the small triangular area at the outer extremity between the ribs, the lung, and the diaphragm, which is unoccupied, is the key to diagnosis, being clear in all cases of simple lung consolidation, but opaque in effusion. It should be observed, however, from both front and back.

Pneumothorax.

Marked pneumothorax is easily diagnosed both by the screen and by the stethoscope, but the doubtful cases of slight degree are those in which the screen is essentially useful. Here the clearness of the transradiant picture in the area not occupied by the lung contrasts with the darker area occupied by the partially collapsed lung. This, combined with the diminished comparative movement of the diaphragm on the affected side, makes a certain diagnosis possible, which might not be the case without the screen.

Abscess of the Lung.

In regard to abscess of the lung, a fact which has been already mentioned is of sufficient importance to bear repetition, namely, that an erroneous diagnosis of consolidation only is very apt to be made unless the patient is examined in the vertical or semi-vertical position, in order that the rays may define the level of the fluid. Many of these cases are very ill, and any effort is apt to induce a fit of coughing exhausting to the patient, and extremely unpleasant to the observer. To avoid this as far as possible a special apparatus, consisting of a canvas stretched on a frame, and movable on a horizontal axis, is of great use. This enables the patient to be partially elevated without any effort on his part. This mode of examination should be adopted in all acute and exhausted cases, such as pneumonia, in which movement is dangerous.

Hydatid Cysts.

In the case of hydatid cysts of the lung and upper surface of the liver, the appearances are very typical, and can hardly be mistaken. In the case of ruptured hydatids also the appearances are typical, but in some cases are apt to be overlooked. In these cases the place of the fully expanded round opacity is taken by a narrow, often irregular, area. Apparently the secretion from the lining wall is expelled almost as soon as it is formed; the expanded lung, which is often healthy right up to the cyst wall, holding its own, and expelling the contents of the cyst through the rupture.

I have diagnosed cases of encysted pleurisy in which the fluid lay between the lobes of the lung, by its position and the peculiar oblong shape of the opacity.

Pneumonia.

The diagnosis of pneumonia is rarely doubtful. The chief value of screen work is in demonstrating erroneous diagnosis of pneumonia. This is especially the case in children in whom all the physical signs may point to a pneumonia about to resolve, when the screen will demonstrate a large empyæma. The X-rays, also, are of typical value in unresolved pneumonias, and particularly so in cases in which the lung is breaking down into abscesses.

An abscess of the lung exhibits the same phenomena on a small scale as empyæma. Consequently, the patient must be examined in the upright or partially upright position, in order to distinguish the cavity partly filled with fluid from a simple consolidation.

The diagnostic value of the screen in pneumonia is well demonstrated in the aged, in whom patches of consolidation sometimes appear without any elevation of the temperature or marked increase in respiration; also in cases in which the consolidation is small and central

Emphysema.

Emphysema is easily demonstrated by the screen. The clearness and breadth of the lung, the horizontal tendency of the ribs, the vertical position of the heart, and the diminution of the lower range of diaphragmatic movement are unmistakable. All abnormal shadows stand out more clearly than normal, and in some cases, especially the aged, there may be seen shadows cast by the larger bronchial tubes which show a tendency to calcification.

New Growths.

The great difficulty in the diagnosis of these conditions arises when the growth starts from the mediastinum, so that its shadow is merged with that of the aorta, thus leading to an erroneous diagnosis of aneurism. In all cases which present difficulty in this respect it is advisable to examine the condition with two tubes, one showing a vacuum of about 5-6 Bevoir, the other about 9; both should have good penetration. The low tube will enable a definition of the extreme limit of the opacity to be formed, and permit of an examination for expansile pulsation typical of aneurism. The high tube will throw more into contrast the two opacities of the aorta and the growth, that of the growth being less marked.

There are certain new growths which are very opaque, but these, on close examination, will be found not to pulsate, as their opacity is due to their firm texture.

Œsophageal Growths.

In the case of œsophageal growths the left posterior oblique examination during the process of swallowing (bismuth, preferably in the cachet form) is the most satisfactory. Only in the rare cases in which the growth is extending beyond the œsophagus will the direct anterior examination disclose any opacity. This will be most marked with the screen in the posterior position, and in all cases the edges of the growth are ill-defined and vague.

Heart Disease.

Examination by the screen is of more value for the heart than would appear to the casual observer. A large portion of the right auricle, most of the right ventricle, a large portion of the left ventricle, and the appendix of the left auricle can be observed.

This enables an opinion to be formed of the size of the heart laterally and anterior posteriorly (the left lateral examination), and abnormalities in size can be located in the particular chambers in which they are present.

Any examination for the purpose of ascertaining the size of any organ or tumour must be made with a proper knowledge of the rules of orthodiascopy. In the ordinary examination room for error is always present, on account of the varying thickness of resonant lung-tissue over the heart, and also the presence of thickened pleura or other conditions likely to mask the outline.

The experienced observer with the screen is able to distinguish a flabby from a firm-muscle heart, and is a very important gain, especially in cases about to have an anæsthetic. The small left side, with prominence of the appendix, and left auricle, with marked enlargement of right side, are typical of mitral-stenosis.

Pericardial Effusion.

In this condition the value of the screen is marked.

Where the effusion is large the pear-shaped opacity, with loss of the heart pulsation, is typical. In small effusions the diagnosis can be made certain by observation of the cardio-phrenic space, which is a clear area normally, but is obliterated with effusion. The retro-cardiac triangle of radiancy will vary with the amount of the effusion.

The combination of radioscopy and auscultation should be made in all cases. It is especially valuable in timing murmurs, the cardiac systole being observed through the screen while the stethoscope is on the chest.

Aneurism.

In the diagnosis of thoracic aneurism the screen is of the greatest value. Many cases sent along as aneurism after physical examination prove not to be aneurism at all, and many cases which, from the physical signs, appear to be small and early, are proved to be large and advanced, and vice versa.

Owing to the fact that a large number of the patients are muscular, powerful men, there is often great difficulty in getting a satisfactory shadow. These cases require a great deal of patience in examination. The anterior and posterior and right anterior oblique examinations are all necessary in all cases of aneurism, and should be carried out as a routine.

The shadow on the screen always shows a certain degree of exaggeration, varying with the distance of the sac from the screen, and in order to obtain a true idea of the size of the sac it is necessary to map it out with the help of the orthodiascope.

By this means, also, an accurate idea of the position of the sac is obtained.

An approximate idea of the depth of the sac can be obtained, and of course helps in the diagnosis of the point of origin. The point of origin is often very difficult to determine—e.g., in the case of a large aneurism of the arch spreading into the mediastinum, and giving a shadow on both sides of the ascending aorta.

If the screen is held in close contact with the ribs and the patient moved from side to side it will be seen that the shadow of the ribs

does not move, while the edges of the aneurism travel horizontally to an extent varying with the depth of the aneurism. This should be done with the patient facing the tube, and also reversed. Also, as Walsham puts it, "If the size of a shadow of a right or left side sac increases upon rotation to the same side, or decreases on rotation to the opposite side, the sac lies nearer that half of the chest upon which it is projecting, and if the change in size takes place in the opposite way the sac lies nearer the opposite half."

The importance of the right anterior oblique examination in cases of suspected aneurism cannot be exaggerated. It often corrects an error of diagnosis made by the anterior or posterior examinations, in some cases proving the absence, in others the presence, of a small aneurism.

In addition, it is of great value in locating an aneurism in the arch, which otherwise would appear to belong to the ascending or descending aorta.

Many cases are examined which show a marked aortic bulge where the ascending is continued into the transverse aorta. These, from anterior examination, lead to the diagnosis of aneurism, but the oblique examination at once discloses the fact that there is no aneurism present at all, the clear space between the two normal opacities being bounded by straight borders.

On the other hand, in the case of small aneurisms marked by the central opacity in an anterior examination, the right anterior oblique will disclose an encroachment of the opacity due to the aneurism in the clear middle space. (It is remarkable that a large number of cases diagnosed as aneurism are shown by the screen to be due to fibrosis of the lung.)

Phthisis.

I would like to conclude my remarks by a reference to the importance and value of X-ray examination in this disease.

I do not intend to consider the subject exhaustively, but to point out one or two points of importance in the examination of early cases.

The diagnosis of early phthisis should be attempted by both screen and radiograph.

The screen will suggest the position of the lesion, and its closeness to front or back of chest, and will indicate the position for the plate, and whether the picture is to be taken in front or from behind.

The radiograph gives a permanent record of the condition for comparative purposes. But for accurate comparison it is necessary to record the time of exposure, the equivalent spark-gap of the tube, the milliamperage of the current, and the distance of the tube from the plate.

Many cases of suspected phthisis come before the examiner in which no trace of consolidation or alteration of tissue in one particular spot can be detected. It is the custom at the Melbourne Hospital to first examine these cases with a tube of moderately high vacuum, and if nothing is detected to diminish the size of the

diaphragm through which the rays pass, and carefully examine the lung with a tube of low vacuum—i.e., one reduced to 4 of the Bevoir tester, going carefully over every part.

A failure to detect any opacity by this method is followed by a careful comparative examination of the two lungs in full inspiration and expiration.

This, to an experienced observer, will disclose a difference on the two sides, and any loss of symmetry suggests strongly, to be acted upon, some pathological condition in the lung whose transradiancy is impaired.

This will be confirmed on examination of the diaphragm, when it will be observed that there is a diminution in the excursions, especially downwards, of the affected side.

DISCUSSION.

Dr. ARGYLE: I think the remarks made by Dr. Strahan with regard to two things alone are very important. One is the question of position and examination of chest cases, and the other the history of the case. I will deal with the position first of all. I was very pleased to hear the suggestion from Dr. Strahan with regard to the canvas operating couch, which has solved the difficulty troubling me for some time. I always make an inquiry before I operate in an upright position, to find out if I may safely do so, as an examination in any other position but the upright is most misleading; but it is possible to get over it by the tilting canvas couch, which seems to me to be an excellent way out of the difficulty, and I shall take an early opportunity of following Dr. Strahan's suggestion.

With regard to the history. It is quite a common thing for physicians to send patients in for examination without sending in any information whatever about them. I beg to state, in my opinion, that that is a truly wrong attitude. The right attitude to take is that the X-rays are to work as a diagnostic agent in conjunction with other physical methods, and after the full clinical picture has been obtained then we should arrive at a decision between us after consultation. If that were done there would be fewer mistakes made, and more satisfactory results. One is constantly finding this state of things. This seems to me to be so very important that it would be well for us to lay great stress on it as a section.

Another thing that neither Drs. Strahan or Ayres touched upon—that is, the difference between a small pleuritic effusion and a thickened pleura. I have frequently found myself puzzled in examining a shadow. The suggestion I make is that the patient should always be in a recumbent position. This may help us to overcome that difficulty. It has been a great difficulty to me. It might not always help us to get over it.

I am convinced, and I said so in my paper on the same subject last year, that we ought to place great importance to the value of the movements of the diaphragm. I am more emphatic on that point now than I was then.

Dr. AYRES: I would like to thank Dr. Strahan for his interesting paper. I absolutely agree with everything he said. There is no doubt that the screen examination of the chest is a slow one, and I think that at such slow examinations it is best not to have the surgeon in the room while you are doing it.

I did not mention a case of hydatids, but it is a very interesting thing. The plate showed a very well-marked border of the cyst, and yet on looking at the plate you can see a light shade, through which you can see the well-marked diaphragm, so that this was an unruptured cyst. At the operation it was found that it was not ruptured, and that there was a small amount of pleural effusion, and I noticed that the diaphragm did not move at all on that side, so that I state in all probability there were adhesions there. I thought that was the cause of the diaphragm not moving.

Dr. HARRIS: I would like to make a few remarks. First, I wish to congratulate Dr. Strahan on his very interesting paper. I will touch on one or two points. I think, for examining various cases, the patient should be in the upright position, which we all admit. If the patient is too bad to be placed in that position, then it is very possible that the examination is not of very much use, and therefore we cannot place too much reliance on the result of the examination.

Another point in connection with hydatid of the lung. It was first pointed out by Dr. MacCormick. When a hydatid of the lung ruptures—when the patient is in the upright position—the upper portion is always horizontal, and no matter how the body be tilted it always remains horizontal. If the patient is lying down you do not get this straight line, and it is impossible to diagnose between a ruptured and an unruptured hydatid cyst; and that is why I think in all these cases the result of an examination with a screen is not of sufficient value unless the patient is put in the upright position. I think that the apparatus mentioned by Dr. Strahan is a very good compromise. As to the movement of the diaphragm, I always place some reliance upon it, but not too much. In some patients the diaphragm will move more than in others.

Dr. Argyle mentioned, and Dr. Strahan also, about the history of the case. I remember, in Melbourne, some doctors did not hold the same opinion as I did on this point. I think every case in a hospital, or private, should have a complete, or fairly complete, history accompanying the same; but I do not think the examiner should read that history until after his examination of the case. I think that is the best way of examining a patient. I think we all ought to adopt this method.

THE SCOPE AND DOSAGE OF X-RAY THERAPY.

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IN speaking about the scope of X-ray therapy I am nowadays treading on dangerous ground, but I feel sure not so dangerous as some people may imagine.

Of course radium has become the fashionable therapeutic agent for many conditions which were once regarded as coming under the category of cases suitable for X-ray therapy, and more besides. To the introduction of radium X-ray therapy owes very much, in that it has been stimulated into higher activity, more accurate dosage, and more careful estimation of the quality of ray used. I am willing to say far more, viz., that, as signs go at present, radium bids fair to ultimately drive X-rays from a large area of the field it now occupies. I refer particularly to the treatment of rodent ulcer and superficial epithelioma of the squamous type not causing glandular involvement. Even further still, so that I admit that should radium become more plentiful, it will be regarded as a valuable means of treating cases of deep-seated carcinoma; though I believe that the President of Congress is perfectly right in his dictum that it cannot be regarded as a cure in such cases, except in very rare instances.

All this, I say, I am willing to admit, for this reason: that even at £25 a milligramme radium is the more economical means of treatment, the more easily applied, the more easily measured, and less dangerous to the operator. If for these reasons only, one cannot doubt but that ultimately the therapeutic action of radium will be deemed preferable to that of X-rays.

This I am unable to admit, viz.: that the therapeutic effects produced by radium cannot be reproduced by X-rays, except within certain narrow limits, which are defined principally by the mechanical difficulties of obtaining an X-ray tube of large enough size and high enough vacuum to produce rays of equal penetrating power to that of some of the harder gamma rays of radium.

Nor will I admit that gamma rays of radium are in any respect different from X-rays except in speed of projection—i.e., hardness. It has been claimed almost without ceasing by radium enthusiasts that gamma rays and X-rays are not identical, and since up till just within a few days it was always upheld that it was by gamma rays that the superior effects of radium were obtained. This is a vital point.

I do not venture to propound this doctrine of the similarity of X-rays and gamma rays as a mere hypothesis of my own. It was first brought under my notice by Dr. Madsen, Lecturer in Electrical Engineering at this University, who worked with Professor Bragg at Adelaide, on the physical properties of radium and X-rays, and therefore had a very great opportunity of becoming an authority in such matters, sitting as he did at the feet of such a great master. Moreover, he assures me that this doctrine is regarded amongst

all physicists almost as an axiom—that whether X-rays and gamma rays be ether waves (a hypothesis now dying rapidly owing to the work of Professor Bragg), or whether they be a couple of respectively positively and negatively charged particles spinning round one another, and together projected forward at a terrific speed (a theory propounded by Professor Bragg, and now almost accepted by most prominent physicists); whether either of these hypotheses, or for the matter of that neither, be correct, still that which answers for one ray answers for the other, and in any case we are dealing with similar radiations.

Nor do I simply rely on the opinions of Dr. Madsen and Professor Bragg, but I am informed by physics men that such is the opinion held by such Napoleons of science as Thompson and Rutherford, and that their ideas are coincident with that of all the other great physicists.

I appeal to the members of the Section whether they would venture to contradict the universally agreed chemists' finding upon the chemical formula of any particular drug, basing their argument upon the different size of the crystals of two different specimens. How much less should one venture to contradict a carefully worked out decision of physicists upon the identity of X-rays and gamma rays, basing one's objections upon the different degrees of penetration, and even upon apparently different effects upon living tissue.

If the contention is to be that hard beta rays are responsible for the different effects obtained, I am glad that, like Canute of old, the radium enthusiasts have quitted one untenable position, but would like to point out to them that there is no more chance of holding the last position than the first, because the mere passage of either gamma rays or X-rays through any substance the collision between the couple constituting an X-ray with a particle in tissue causes either the separation of the two particles constituting a gamma or an X ray, and leaves a negatively charged gamma particle shooting off with, perhaps, only slightly diminished speed, or chips off a particle of the stationary molecule, and sends it off on a similar errand. These beta rays are not hypothetical, but can be deflected and measured in substances irradiated by X-rays or radium (screened off to give practically only gamma rays and a few hard beta rays). This is a hard, immutable physical fact, and will bear no contradiction. Therefore, if beta rays are to be credited with producing an action different to that of X-rays, how shall we explain away the fact that these same beta rays occur in measurable amounts in tissue irradiated from a Röntgen tube?

It may be objected that these, being secondary rays, and travelling comparatively slowly, do not produce the same effect as fast-travelling beta rays.

Again, let me point out that substances irradiated are affected both by radium or X-rays, not in proportion to the number of rays passing through them, but in proportion to the number of rays blocked by and absorbed in them. This is a well-known fact, and I think would hardly need mention were it not necessary to point out that these beta particles, be they primary or secondary, affect the tissue in which they are absorbed, and not to any appreciable extent the

tissue which they penetrate. Therefore, I think that it must be admitted that the theory of the action of beta rays, as distinguishing the effect of radium from X-rays, is equally untenable as that which seems, at this meeting at least, to have been given up.

To hear this diatribe the Section would, perhaps, imagine that I am not convinced of the therapeutic value of radium. Therein a mistake would be made, for I have always been an ardent adherent of radium as a therapeutic agent, and am becoming more and more convinced of its practical utility. But this much I do say: that in surface conditions, such as rodent ulcer, epithelioma of squamous type arising from the skin, *nævus vasculosus*, lymphosarcoma, &c., given modern X-ray apparatus with a hard tube, a m.m. or two of aluminium and some Sabouraud pastilles, effects identical to those obtained by using radium can be obtained by a modern X-ray therapist, as I shall endeavour to prove to you later.

Therefore I say, and I say what I have thought and deliberated upon for many months, that if we are to put radium therapy upon its proper footing we should say that we prefer it to X-ray therapy for the following reasons:—

1. That it is cheaper, the initial cost being the only one.
2. That it is more easily applicable, not only in angles and corners, but on a plain surface.
3. That the measurement of its dosage is easier, being simply by time, seeing that the radiation is constant.
4. That when filtration is desired, that all these previous reasons become more apparent on account of the wear and tear on tubes, and the time of exposure and the difficulty of measurement in determining equivalent doses of X-rays.
5. Because the use of it is much less dangerous to the operator even than a carefully shielded X-ray tube.

But at the same time let us confess that we are using the same agent obtained in one case by discharge of current through a Röntgen tube, while in the case of radium the rays are produced spontaneously. This I strongly feel to be the right procedure if we are to correct a very real reaction existing in the minds of the medical fraternity in Sydney, at least against unwise enthusiasm over a really valuable therapeutic agent, backed up by an almost hysterical claim for unreal advantages over other agents of almost equal or greater value. That such has occurred, I think there is little doubt in the minds of most medical men in Sydney. That the reaction has also occurred cannot but be apparent to every member of Congress who heard or read the President's address.

That radium is really an effective cure for some forms of cancerous growth, such as rodent ulcer, superficial epithelioma of the squamous type arising from the skin, and some other not too deep-seated forms, I feel sure that nobody with any direct or indirect experience will combat for a moment. But if I understand the President aright, he means that radium cannot be held up as a cure for cancer in the sense accepted by the general lay public, and can be only honestly recommended as a generally palliative and a rarely curative agent.

Are we children or an ignorant public, to be led away into error by the sight of a few pictures healed by this agent, to the conviction that radium is a therapeutic agent preferable to surgical ablation for epithelioma of mucous membranes affecting glands, or likely to affect glands? Let us be honest with ourselves, and let each man place the case to himself in this way: in the event of the occurrence of epithelioma on his own lip or tongue, what method would he prefer? I have no doubt as to the answer, and I feel sure that very few here would be satisfied to wait and see if radium, perchance, would effect a cure.

Before going further into the merits and difficulties of X-ray therapy, let me point out the probable means by which the action is produced.

Most people now know something of X and beta rays, and of gamma rays and X-rays. They know that alpha-rays are an agglomeration of positively charged particles, that beta rays are single negatively charged particles, and most people now accept the theory that gamma rays and X-rays are a couple of particles, carrying, respectively, a positive and negative charge, and held apart by centrifugal force, the result of rotation round one another, and at the same time projected forward, at an immense speed.

From the point of view of physics, all the effects produced by beta rays and X-rays and gamma rays are traceable to ionisation as seen in the discharge of an insulated electroscope by the attraction of negatively charged particles to the positively charged portion of the electroscope, and vice versa.

In all probability the same effect is at the base of all results obtained in irradiating living tissue. The atom or molecule is now supposed to consist of an equally balanced number of positively and negatively charged particles. The advent of a beta ray, for example, in the neighbourhood of such an atom will result either in the collision and reshuffling of mutually attracting $+$ and $-$ particles, leaving an atom a $+$ particle short or a $-$ particle too many. In either case the balance is disturbed, and the atom, as such, ceases to exist, and the cell may die and be removed by leucocytes.

Or actual collision may not occur, but the phenomenon of coming may be that which is responsible for the effect produced. If the beta particle is travelling at a high rate of speed, and passes near the atom, it is deflected in its course even as a comet coming within the sphere of attraction of a planet is deflected from its previous line of travel. If travelling slower, or the attraction is greater, it may actually spin round and return in the opposite direction, or circle round and round and come to rest, thus disturbing the balance of the atom by the addition of a negative particle.

In dealing with a X-ray or gamma ray, one has only, first, to imagine an inevitable collision, the separation of the couple, the freeing of the independent $+$ and $-$ particles, which fly off at a tangent, to behave just as the above-described beta ray, in order to understand the similar action.

That such occurs in the radiation of matter is a fairly well accepted physical hypothesis; that beta rays are produced by irradiation with gamma or X-rays is a physical fact. That such is the explanation of the

action of X-rays on living tissue is a hypothesis which has this advantage: that it explains in a reasonable fashion many things otherwise inexplicable. That X-rays have a selective action on rapidly-growing cells is a well-known fact. Why they select these in preference to formed tissue is difficult to understand unless we adopt some such hypothesis. All rapidly multiplying cells have a large amount of nuclear material, which in turn contains a large amount of phosphorus, which again is of higher atomic weight than the other elements constituting living tissue—e.g., C.H.N.O. All substances absorb X-rays, gamma rays, and beta rays of equal penetrating power in proportions varying with their atomic weight, and, as substances are affected in proportion to the number of rays they absorb, it is easily understood by what process the selection is brought about.

To a physicist the existence of a higher atomic weight of one given substance is quite sufficient to explain the reason of its absorption of more X-rays or gamma rays than is the case in radiating a second substance of lower atomic weight; that in the case of living tissue the high phosphorus content of the large amount of nuclear material in a tumour mass is responsible for the selective action of X-rays and radium rays on all rapidly-growing cell-masses is a personal hypothesis which has a reasonable base, and is supported by analogies from physics.

That the therapeutic action of X-rays and gamma rays is due to the upsetting of the balance of positive and negative particles constituting an atom by the addition of a secondarily produced beta ray or particle (which is especially likely to occur in masses very rich in nuclear material) is another hypothesis based upon analogy with observed physical phenomena. Upon it may depend other changes—e.g., lecithin, &c.—which might reasonably be supposed to be secondary to such a fundamental effect.

The nearer the rays approach one another in degree of penetration or hardness the nearer is this law of absorption fulfilled. Therefore we can understand why, in using very hard rays, the selective action is greater than in mixed radiations.

Moreover, if we wish to leave intact the surface elements—e.g., skin—and affect deeper structures—e.g., endothelium in *nævi*, &c.—we must utilise the selective action to the best of our ability; therefore we must use a fairly homogeneous bundle of hard rays. Or, in other conditions, we may adopt cross-fire, utilising different areas of skin and making our rays cross in the depths and there give double or treble effects. Or we may use both expedients to give us the best effects according to the exigencies of the case.

Another point which I wish to bring prominently before you is the fact that frequently repeated small doses of ionising rays, such as X-rays, for example, have a distinctly irritative effect, as instanced by the occurrence of hyper-keratoses, and even epithelioma, on hands chronically exposed to X-rays.

The same result is observable in cases of epithelioma treated with insufficient doses of rays when (1) the irritative effect outweighs the destructive, and increased growth may be noted; or (2) these

effects balance one another, when little benefit is produced; or (3) the result is slow to become complete, according as the irritative or destructive effect predominates.

Therefore I wish to impress upon everybody using ionising rays, be they what they may, that to produce the best effects, especially at a depth, there should be administered in almost all cases the largest dose tolerated by healthy skin, and that in one sitting if possible; that the rays should be as homogeneous and hard as is reasonably possible.

On ulcerated surfaces a double erythema dose may be administered without reaction; on a fungating surface a treble dose may be delivered, preferably by adopting a cross-fire method, with most astounding beneficial results provided healthy skin is duly protected.

In order to perform this several things are necessary:—

1. One must know the quality of ray employed, and for this a Benoist or a Benoist Walter radiometer is essential.
2. Filtering may, and often will, be necessary in order to cut off those rays which cannot do more than be absorbed in, and affect the surface layers, and therefore cause an erythema of the skin without helping at all in the therapeutic action of the deeper-penetrating rays.
3. Accurate measurement of the dose is absolutely essential, and for this I think a Sabouraud pastille is the best means yet worked out.

To my mind anybody who does not do this, and all this at least, cannot hope to be qualified to express an opinion on the value of X-rays as a therapeutic agent in any one condition.

The use of X-rays as a therapeutic agent is limited in the minds of most medical men to the treatment of rodent ulcer and skin epithelioma. This is undoubtedly the chief use, and nobody is stronger than I in the belief that such treatment is the method of choice in most cases where the face is involved, except only when bone is extensively involved. But, in addition to this, there is a vast array of conditions which are amenable to the ionising effect of X-ray treatment, though they may have proved most obdurate to ordinary forms of therapy.

Let me first mention lympho-sarcoma. I have now on two occasions heard first hand how cases of this disease, inoperable, hopeless to all appearance, have melted away before suitable X-ray therapy. The literature abounds in cases of this disease which have been so treated, several cases of intrathoracic growths causing pressure symptoms, with glands in the root of the neck which, on incision, have shown lympho-sarcoma, have been cured, and have remained without recurrence for some years. I have not been fortunate enough to get such a case myself, but I want to point out that these cases, often so malignant, so soon becoming inoperable, are the most susceptible of all forms of new growth to X-rays.

Another case of multiple lympho-sarcoma is being shown by Dr. Skirving, for whose wonderful improvement I can vouch.

In conjunction with this disease let me mention lymphocythæmia, of which many cases are reported in the literature as treated by X-rays. One case only has come under my notice, almost moribund. He was treated in Royal Prince Alfred Hospital, with great benefit, his leucocytes diminishing to one-third their previous numbers, and his reds going up from under 3,000,000 to 4,500,000. His glands almost quite disappeared, and he felt generally much better. He recurred, of course, and died a year after treatment, although his life was undoubtedly prolonged for a long period.

Myelocythæmia also is reported to improve remarkably under X-rays; indeed, to yield to it as it yields to no other treatment.

Another condition which comes into this category is lymphadenoma, a condition for which I am convinced we have no agent half so effective as X-rays. The glands disappear, the red count and Hb. value increase, and all pressure symptoms disappear; the patient feels well and fit for ordinary occupations in life.

A case in point came into my hands on 4th April, 1911. Mrs. T., æt. about 48. Large glands, size of pigeon's egg in neck, masses of glands in each axilla and groin. Respiratory obstruction apparently at base of right lung (Dr. Blackburn and Dr. McIntosh). Difficulty in swallowing. Reds, 4,600,000; whites, 6,000; Hb. value, 80 per cent.

The chest being the most in need of treatment, a series of five full erythema doses, cross-firing and utilising all available skin areas, was made in one sitting. The axillæ were included. A fortnight later the patient was much relieved, had no distress, nor difficulty in swallowing. Axillary glands much smaller.

The next exposure a month after first included six positions on the chest, six on the abdomen, including groins. A fortnight later there were no distressing symptoms; glands in neck and axillæ had disappeared, and red count amounted to 4,800,000; whites normal. Six weeks were allowed to elapse before a third dose was given, when a similar series to No. 2 was delivered. A week after this patient exhibited a toxic erythema, no doubt from absorption of destroyed cells.

At present the patient has a few glands just palpable in left inguinal region, and some of the abdominal glands are apparently still enlarged. Her general health is apparently normal, at any rate to the patient's complete satisfaction. Patient writes from Switzerland, eight months after treatment, to say she is quite well, and has no sign of recurrence of glands or respiratory difficulty.

It must be understood that a cure in these conditions is more than problematic; but there can be no doubt that the relief obtained is such as is never obtained by arsenic, operation, or anything else; that the prolongation of life is much greater than by any other means of treatment, and that without any disturbance of the patient, except perhaps a sensation of malaise and some slight rise of temperature from absorption of destroyed cells after an extensive series of exposures. Therefore it is, to my mind, the treatment of choice in such cases which are otherwise invariably fatal in a short period.

Another disease of which very favourable reports are given under X-ray treatment is exophthalmic goitre, a cross-fire of hard, probably filtered, rays being given to the gland. The well known inhibitory effect on cellular activity, reproductive and secretory, is sufficient to explain this effect.

I have not had an opportunity of personally testing my conviction that such cases would yield to X-ray therapy.

To get away from these diseases, which are, after all, of little interest to us as dermatologists, I wish to draw attention to the undoubted effectiveness of X-rays on psoriasis, and suggest the more frequent use of this agent in treatment.

1. Of obstinate plaques, especially about knees and elbows.
2. Of odd patches on exposed parts—e.g., face and hands—where the use of chrysarobin is contra-indicated, and in order to avoid unsightly applications.
3. And particularly in treatment of that most obstinate and un-get-at-able condition, psoriasis of the nails.

It is in this last category that I have found X-rays most useful, two half erythema doses, with a three weeks' interval, having been sufficient in securing a normal nail growth in a lady who for years had not had a normal nail on her hands. Of course the old, ill-formed nail has to grow off, but following it comes normal nail tissue, adhering to its bed to the end of the finger. This lady, too, who has suffered for years, frequently comes in to have a patch rayed about neck, arms, and shoulders, refusing absolutely to use chrysarobin on exposed parts, owing to the after-discolouration.

But with regard to eczema, it is not generally known that in those extremely obstinate thickened scaly eczemas which have resisted all forms of treatment, even that of crude coal-tar, will almost invariably yield to two or three half to one-third erythema doses of rays, delivered at intervals of about fourteen days, and the skin will have returned to normal without any local applications in the meantime. Not only these cases, but also those in which successive outbreaks of vesicular eczema, alternating with stages known as *état ponctueux* and squamous eczema, that break the heart of the medical attendant by relapsing as soon as he begins to flatter himself that he has reached a stage of convalescence—these, too, yield to fractional doses of X-rays when they resist all other means.

Mrs. D., æt. 27, had for years suffered from an eczema of this nature on wrists and hands. No local cause could be ascertained, and no ordinary treatment availed, though everything had been tried, from Lassar's paste to crude coal-tar. Just as one flattered oneself that the half-way house had been reached, down came the relapse. At last, in desperation, I rayed the hands, delivering half erythema dose with a 3-4 B.W. tube. The result was remarkable. An appreciable reaction followed over the eczematous areas, although normal skin in between showed no effect whatever. At the end of a fortnight the eczema had ceased weeping, and was healed, except that the skin was noticeably thicker and harder than elsewhere. A second dose was then delivered, and the skin returned to normal, and has remained so now for six months.

Another case, also a lady, æt. 25, also for years had an eczema of the hands, which precluded any use for everyday work. A great gardener, she was asked if outbreaks of eczema followed a bout of gardening. Nothing was elicited by that line of inquiry; attacks came on at any odd time, and without any connection with periods of gardening activity. As all ordinary methods had already failed, I tried immediately with rays, in a similar manner. After a fortnight the improvement was so great that the patient expressed her opinion that she had not been so well for two years. Another dose was delivered, and the improvement continues. Still under treatment.

In dealing with eczemas and psoriasis, the operator must be careful to deliver not more than a $\frac{1}{2}$ E. dose to an eczema, except it be an extremely chronic one, nor $\frac{3}{4}$ E. dose to a psoriasis, on account of the extra radio-sensibility of these conditions. They will react fiercely when the intervening normal skin shows no redness at all.

To ringworm of scalp and beard I shall not refer at all, beyond pointing out the obvious fact that if rays are obtainable it is not a question of treatment of choice, but that it simply comes to being X-rays first, the rest nowhere.

I am now awaiting with considerable interest the result of two cases of alopecia areata (one "totatis") which I have rayed as a result of the promising reports of such cases treated by rays. A full erythema dose was delivered in each instance, but the time for regrowth is still a month short.

Two cases of granuloma annulare have come under me, one of which cleared up under radium, the other after a single application of X-rays. Both had persisted for years, and occurred, strangely enough, in adults. The models of these conditions are here for examination. They resist all other treatment most obstinately except, as Dr. Verge tells me, the influence of crude coal-tar.

On keloid and acne keloid the result is well known, but to get the best results one must use hard 5-6 B.W. rays, filtered through 1 mm. aluminium, and given in exposures of about $1\frac{1}{2}$ erythema doses.

In the treatment of tubercular conditions of the skin, exclusive of lupus vulgaris, which indeed is greatly benefited if ulcerated, there can be no doubt that a few full doses of X-rays act like a charm, and flaccid granulating surfaces, such as occur in scrophuloderma, &c., flatten down and cicatrice in a few weeks after having persisted for months.

N.G., æt. 12, with scrophuloderma of chest, repeatedly scraped, and treated for months without healing, was given two erythema doses, with fourteen days' interval. At the end of a month cicatrization was complete.

A.B., æt. 21, scrophuloderma of neck, after scraping of tubercular glands, persisting for four months, in exactly similar manner and time.

Tubercular glands of neck, especially large projecting masses where cross-fire can be worked, yield wonderfully to two or three such exposures of a double or treble cross-fire of 10 x each—i.e., one erythema dose.

R., æt. 21, had a huge mass of glands behind angle of maxilla, on right side. Mass was as large as a cricket ball. It had on several occasions been opened and scraped, but radical operation was almost impossible in view of the matting of the tissues and deep involvement. On passing a probe along various sinuses, no loculi of pus could be found, and the mass seemed fairly solid. After two exposures of treble cross-fire 10 x (one erythema dose) each way, 5-6 B.W. rays, the mass diminished to one-third its original size. A third exposure was given three weeks ago, and improvement is continuing. Patient is now quite well for five months.

In speaking of X-ray therapy no description would be complete without alluding to rodent ulcer, the great friend of the dermatologist in Australia.

The method I have adopted, after long evolution, is to scrape or freeze with CO₂ snow, and then to ray fiercely, especially if fungation is present, or the patient's time in town is limited. One erythema dose, filtered and measured through 1 mm. aluminium, is administered to the ulcer and a considerable margin of healthy skin surrounding the ulcer. Then, by cutting a hole in a piece of thin sheet-lead to accurately outline the ulcer, another full dose is delivered, making two in all to this area. This is repeated in about three weeks, and at the end of about five weeks the condition is generally healed. A third dose is given to safeguard against recurrence, and a fourth if any infiltration existed at the time of the third exposure.

Not all the cases here described have been treated in this fashion, but I feel convinced that I should have obtained more rapid results had the method above described been followed.

These cases number thirty-one in all—I refractory; 1 untreatable on account of stench (sent to hospital); still under treatment, 4; cured over six months, 15; over three months, 4; under three months, 5; not heard of for six months, 2.

The first case I shall describe will be the failure. J.H.R. (Dr. MacCormick), three times operated upon for rodent ulcer; whole of nose, except septum, removed. Last recurrence was in neighbourhood of nasal process of right maxilla, and near the frontal sinus above. These nodules were excised, together with a large amount of bone; but, as a suspicious nodule on floor of nose existed, he was sent for X-ray. This mass was diminished, but not cured, and a sinus was found to run from floor of nose through the alveolar process along the socket of canine tooth. Found, on examination, to be mixed rodent and squamous epithelioma. The superior maxilla was therefore excised.

Mrs. W.A., æt. 66 (Dr. Kearney). Suffering for two years with rodent ulcer of nose, now involving both alæ and septum, having destroyed a large amount of soft tissues, but not yet involving bone. On back of hand is another rodent, much infiltrated and warty on top.

Patient had already been treated in hospital for six months with X-rays, given in small doses every three days, not only without improvement, but with actual spread of the condition.

The method of treatment was to deliver a full erythema dose to each side of the nose, so that by cross-fire each side got somewhat more than a full dose. The quality of ray used was 4-6 B.W.

The result was remarkable. After the first dose the nose was evidently better; after the second it was healed, though some infiltration persisted; after the third dose the infiltration disappeared; and a fourth, and afterwards a fifth, application were made solely by way of precaution.

Thus, at the end of two months, the nose was completely healed by a different method of application of the very means which had failed dismally previously. This has several times occurred in my experience.

The hand was similarly treated, with a like result. This is a most instructive case, showing, as it does, the frequently observed irritative action of small doses of X-rays followed by the favourable curative, selectively destructive, effect of large erythema doses; also because the extensive involvement of cartilage did not interfere with the beneficial action of the hard rays.

The patient has remained well for nine months, and is so at present.

S.H., æt. 72 (Dr. Hinder), suffering from rodent ulcer of nose; thrice operated upon, last time very extensively, and nose reformed by plastic operation. (7/8/10.) Five months later, on left side of nose over nasal bone, there existed a large ulcer, rather bigger than a shilling, with edges heaped up $\frac{1}{4}$ inch all round, deeply excavated in centre, almost perforating into nasal cavity. No bone to be felt at base, showing nasal bone to be involved and perforated.

In addition, there was a warty growth as big as a large pea on right ala of nose, and between this and the ulcer are infiltration, apparently arising from the periosteum under the skin graft.

All these lesions were treated with great care, but with large doses. On the ulcer each fortnight double erythema doses of hard 6 B.W. rays, filtered through 1 mm. aluminium, were delivered, and to the others one erythema dose of similar rays followed in the case of the warty growth by a localised dose of unfiltered rays.

The ulcer was given both doses filtered because of the evident involvement of bone and the necessity, therefore, to give a dose of sufficient penetrative power to actively influence the bony growth.

This case took considerably more time to heal than the foregoing, principally because of the bone involvement; but the ulcer, after seven principally because of the bone involvement; but the ulcer, after seven applications (140 x, fourteen erythema doses, of 6 B.W. rays, filtered through 1 mm. aluminium), was completely healed, although a probe could now be passed into the nasal cavity through a hole in centre of the thin membrane which formed the base of the depressed site of previous ulceration.

The warty growth and subcutaneous mass yielded to less (100 x), or ten erythema doses of similar rays.

This patient's history is again very instructive in that it shows that a growth involving a bone is not necessarily beyond benefit by X-rays, provided rays of sufficient penetrative power and in sufficient doses are administered.

During the treatment the patient was almost continually showing erythema, but only in one instance did any vesiculation occur, and that after the last exposure. After a month's spell this had completely disappeared, and the whole thing was healed.

The patient has now remained under continual observation for ten months without any sign of recurrence.

F.B., æt. 53 (Dr. MacCormick). Operation thought inadvisable, because complete removal would have involved removing skin from about one-third of the face area. There was a large epithelioma about the size of half-a-crown over left malar bone, a smaller shilling-sized one on the left temporal region, and at least a dozen smaller growths scattered over left temple, left mastoid region, and right eye. One of these smaller ones was excised and examined, and found to be rodent ulcer.

Patient could only remain in Sydney six weeks, therefore larger ulcers were scraped under cocaine. The whole area involved received an erythema dose, filtered through a 1 m.m. aluminium, while in addition the ulcerated areas received another erythema dose. The rays used were 5-6 B.W.

This was repeated once a fortnight. After the second there was considerable erythema over the whole exposed area, so that the third exposure was limited to the areas actually diseased. By the end of six weeks the condition was completely healed to the satisfaction of Dr. MacCormick, whose case he was, and the patient returned home. He wrote to me a month afterwards to say all reaction had disappeared, and everything was healed. Another letter six months later said there had been no recurrence.

J.P., æt. 42 (Dr. Hinder). Operation deemed inadvisable, because removal would have meant inevitable extirpation of part of facial nerve, which ran directly under ulcer. Ulcer as large as two-shilling piece, excavated $\frac{1}{4}$ inch, edges heaped and infiltrated. By a total of six erythema doses of 6 B.W. rays, delivered in three sittings, this ulcer healed completely, and has remained without recurrence for four months.

P.J.K., æt. 75. Small rodent on bridge of nose, size threepenny-piece, edges infiltrated, centre depressed and ulcerated; persisted for two and a half years. One erythema dose, 6 B.W. X-rays 1 m.m. aluminium filter, to ulcer and skin immediately surrounding it; one erythema dose to ulcer itself. Three weeks later the ulcer was completely healed after one dose. A second application was given for safety. No recurrence in five months.

G.P., æt. 56. Small rodent ulcer near inner canthus of left eye. Healed completely after two full erythema doses, given in two sittings fourteen days apart. Three weeks later a third sitting of 15 x (one and a half E. dose) given as safeguard. No recurrence for nine months.

J.M., æt. 80 (Dr. Skirving). Three large rodents of face, which have persisted for four years. On forehead was a large area as big as three half-crowns, scarred in centre, ulcerated, and infiltrated at edges; on cheek a fungating epithelioma of diameter of shilling. On

tip of nose, and extending inside for area of $\frac{3}{4} \times \frac{1}{2}$ inch, a third ulcer with very thickened edges, excavated bleeding base, and very painful. All these three yielded completely to 60 x (six erythema doses), delivered in three sittings, 6 B.W. tube, 1 mm. aluminium, with three-weekly intervals. This is a noticeable case in view of the age and feebleness of the patient, which precluded operation, and the rapid and complete cure which resulted.

H., æt. 24 years (Dr. Buchanan). Rodents of both lower eyelids, left lower lid being almost entirely destroyed. On tip of nose was another ulcer, and scattered about the face about half a dozen smaller growths. One was excised, and found to be rodent ulcer. Difficulties, owing to dangers of exposing the eye, were overcome by cocainising the conjunctiva and inserting a thin sheet of lead inside the lower and outside upper lid, and then raying the lower lid. After two erythema exposures the lids have almost completely healed, although some infiltration still persists. A third exposure has been given, but the patient is still under treatment. This case is worthy of note in that he is so young, and yet so advanced in the disease. He also shows remarkable and rapid improvement under single erythema doses, although larger doses might well have been given with greater success still, had it not been for the fear of causing some disturbance of sight.

Hyperidrosis of axillæ and feet also yields to erythema doses of hard 5-6 B.W. rays. This action is simply one of inhibition, and may not be permanent.

W., æt. 48. Continual sweating of feet; no disagreeable odour, but continual discomfort owing to the socks being continually wet with sweat. Each erythema dose checked the sweating, and after the third it was much diminished, and patient, who was a medical man, expressed himself as convinced that he was greatly improved. Still under treatment.

This condition of hyperidrosis is most difficult to control otherwise, and a monthly X-raying is much preferable to continual dusting of feet with salicylic zinc powder, &c.

Pruritus vulvæ of the type which is the *bête noir* of every dermatologist is, in my opinion, best treated by erythema doses of X-rays. The sedative action is remarkable, and occurs in a few days. Three or four exposures are generally necessary to obtain permanent relief; but nothing else will do anything.

Mrs. T., æt. 45, wildly neurotic, once melancholic, had suffered for two years from pruritus vulvæ, which now bade fair to drive her over the border-line of insanity again. She was relieved for a time by 1 per cent. menthol in Lassar's paste, but by-and-bye this lost its effect, and other agents failed dismally. After one erythema dose the patient, on the fourth night, slept continuously through eight hours, an experience she had not had for eighteen months. The itching had not returned when she came back three weeks later for her second dose. This was only a fortnight ago. From other similar cases reported, I now have every hope of curing her completely.

Plane warts are well known to disappear very rapidly under one or two erythema doses of X-rays. One case which I have had to treat almost completely cleared under two doses, but a few persisted.

Nævi Vasculosi.—Here we enter a field supposed to be the sole property of radium therapy, and to be the crucial test for distinction between gamma rays and X-rays. Yet, on really making the experiment, the supposed differentiating test is found to give a result strongly supporting the theory of identity of nature of the two rays. Providing hard rays (5-6 B.W.), preferably given filtered through 1 mm. aluminium, are administered in erythema doses or a little under, these cases are found to react very favourably and very rapidly to treatment by X-rays. One raised and one flat *nævus* have been so treated, with excellent results.

B.F., æt. 12 months, had on left temporal region a deep vascular *nævus* about diameter of two-shilling piece, and raised $\frac{1}{4}$ inch above level of skin, turgid, increasing considerably in size when child cried. It began soon after birth, as a small pin-head spot, which had grown fairly rapidly to present size, and, in the opinion of the mother, was still growing.

This child received three exposures, at intervals of three weeks, of hard 5-6 B.W. rays, each time in full erythema doses, one unfiltered and the other two filtered through 1 mm. aluminium. At present, one month after last exposure, three months after first exposure, the *nævus* is flat with the surface, firm, and only slightly pinkish in colour—cured.

M.S., æt. 20, had most extensive superficial *nævus*, involving the whole face (except a small area on left frontal region), a large part of neck, chest, and back, the hands, while scattered over rest of the body are areas of a deeper or lighter shade.

This case was so extensive as to almost prohibit radium; CO₂ snow was not kindly accepted, therefore treatment with X-rays over extensive areas seemed alone feasible.

The results were equally favourable as in the previous case, three exposures causing a complete cure in the heaviest *nævus* area on the neck. Present treatment with the whole face is meeting with similar success, the colour being reduced one-half by two applications just under the full erythema dose. The rays used were hard 6 B.W. rays, filtered through 1 mm. aluminium.

This case is almost certainly progressing to complete and rapid cure, and I should like to recommend others to use this method when dealing with extensive cases of *nævus vasculosus*.

Hyperkeratoses, the pre-cancerous conditions of skin so frequent in Australia, react to give a perfect result in two or three exposures with X-rays. Again, hard rays I find to be preferable, and full erythema doses necessary.

Three very extensive cases, involving the face and hands, but without any actual rodent formation, cleared completely by this method. None were refractory.

Numerous other cases classed with rodent ulcer cases, on account of the coexistence of one or more such lesions, cleared as completely as the uncomplicated ones.

This method is easily applied to extensive cases, especially to hands which are frequently dotted over with warty lesions. The whole hand may be exposed, and then half a dose extra be given to particular warts by shielding the rest of the skin.

Mode of action of X-rays in these conditions:—

1. Destructive—*e.g.*, in large erythema doses in epithelioma and lymphadenoma, granulation tissue, &c.
2. Inhibitive; to cellular activity other than reproductive—*e.g.*, prevention of sweat and fat secretion.
3. In eczema, psoriasis, &c., the action must be different. If we say it is alterative we would put a name to it and know no more about it. But the fact remains that some such action must occur. Excessive proliferation of the basal layers is undoubtedly checked, and the excited, hysterical, hasty production of horny cells is replaced by steady regular stages and complete keratinisation, and the formation of a suitable protective layer. It is possible that the mere checking of proliferation is sufficient to explain this slower and more perfect production of horny layer, and that a well-formed horny layer is sufficient to protect the deeper layers from further irritation.

In writing a paper on this subject one is faced, not so much with a difficulty in finding material, as in excluding and selecting material. Indeed, as I look back and consider what is the most useful therapeutic agent to me as a dermatologist, I cannot help thinking that this means is the most often used and most trusty weapon in my armoury.

Its modes of employ must be carefully worked out; it must not be wielded the same way; must not deliver the same stroke against every enemy; and, chiefly, its use must be carefully measured, and the quality of the rays accurately estimated to get really good results.

DISCUSSION.

Dr. LAWRENCE: I have listened with very great interest to Dr. Molesworth's paper, which I think is certainly interesting, scientific, and up-to-date. Dr. Molesworth has had great experience with the X-rays, which have been recognised for many years as one of the greatest therapeutical agents we have. Dr. Molesworth mentioned Professor Bragge in connection with radium rays. I have had several discussions with him as to how his work is carried on, and chiefly about the secondary rays, and it was carried out with my radium, which I lent to him. There were several questions I asked him in connection with the rays. Dr. Molesworth mentioned the various skin diseases he uses the rays for, and I certainly have done so for many years. I have treated one or two medical men.

As far as the treatment of psoriasis goes, I remember, at the Congress in New York, I described what was an X-ray bath. I had one constructed, and gave it to the patient, to use for twelve months. Of course it was a rather crude thing. One case of psoriasis was in a man who had it for twenty-five years; he had been to Europe twice for treatment, and he came here and said he had been to So-and-so—this was in 1906—with no results. The trouble was, he could not go for a swim—could not expose himself for a swim. I treated him with the X-ray baths, and very soon the disease cleared up. Then he got recurrences, after a time, of punctate spots. I took two or three specimens of radium to put on, and he was so pleased that he got some radium for himself; he used to use this every time the spots came on. But after about twenty months he was cured, and I have his radium as a present from him. However, I congratulate Dr. Molesworth also on that result of the X-ray treatment of the two cases of vascular nævus. There is no doubt about it, we all recognise the X-rays. When I spoke of radium I was only speaking of radium as it applies to me. I recognise we get into grooves in one line, and we ought not to. If we are going to treat a case with X-rays, better give a big dose of X-rays; the same with radium.

Dr. AYRES: I would like to congratulate Dr. Molesworth. It seems a curious thing that at one time the rays which were said to have the most curative effect were the soft rays, whereas now it seems that the hard rays are the rays which really do good; but this change has only come about since the introduction of filters. As regards Dr. Lawrence's remark about Pusey's large doses, I also know of a case of Pusey's in which the X-rays had been used for some time without any good effect. He tried to get the surgeons to operate on this case, but they would not do it. The case was sent back to him; enormous doses were used, and the case got better. But no details were given as to what the enormous doses were. I think, however, it is by the use of the filters that we are getting very much better results. As I said in my paper, I am experiencing the same thing.

Dr. ARGYLE: I would like to thank Dr. Molesworth also, particularly for the scientific portion of his work. I am very interested in the statement of Bragg's modern view of the meaning of the X-ray. I would like to know whether that view is accepted, or is it just his view of the case. It is theory in any case. I would like to know if his views are accepted by men like Sir Oliver Lodge and others who work in that line?

Turning to the cases, two things occurred to me. My experiences in lymphadenoma and lymphocythæmia have not been what I would call at all satisfactory. In lymphocythæmia I found that although the patient sometimes seemed improved, the size of the glands or the swelling diminished, still the disease progressed just the same; and it is just the same with lympho-sarcoma. The patient improved up to a certain extent, the size of the enlarged glands diminished; but

the ultimate end was the patient succumbed. Most of these cases last a little over two years. My experience has been, although I got a lot of improvement, I did not control the disease at all.

One other point with regard to the treatment of tubercular glands: it was in my paper: If there is any one condition in which the X-rays treatment is always triumphant, it is in the treatment of tubercular glands. I am convinced that primary X-ray treatment is the treatment for tubercular glands, operation or no operation, and if I am asked for my opinion I would advise that X-ray treatment be resorted to from the beginning of tubercular glands.

Dr. CLENDINNEN: I would like to thank Dr. Molesworth for his interesting paper. I may say, through the courtesy of Dr. Molesworth about a year ago, I had the privilege of witnessing some experiments conducted by Dr. Madsen at the Sydney University. I would like to have another interview, to see the outcome of those cases with the radium and the rays. Dr. Molesworth has had the opportunity of not only doing the practical work, but also doing the scientific branch of the work, and has had the experience of Dr. Madsen.

As we have said before, there is a little misunderstanding about these rays. They are modified with the screens. It is a matter of picking out what is the best to use—X-rays, radium, or any other; you get the same results.

In regard to the case Dr. Molesworth showed us to-day, we also saw at the Sydney Hospital a similar case, but treated with radium, so that there is a certain amount of similarity. With the X-rays, however, you can cover a larger surface. I would prefer X-rays to radium in this case, because you get over a larger surface, and you get the whole surface treated at the one time; but with radium you are apt to cover the same ground, and only do patches. But it all depends on the area to be treated whether you use radium or X-rays.

Dr. MOLESWORTH: Dr. Lawrence said he seemed to be rather in doubt about the difference in effect between the hard rays and soft rays. I would point out that they have always the same effect, producing an ionisation of the tissue, but that when soft rays are used a large proportion are blocked in the superficial layers, causing a great effect there, and prohibiting the administration of an effective dose in the deeper layers by concentrating the action on the surface and allowing only few rays to penetrate to the depths; whereas the hard rays which we use, though still producing a greater effect on surface than in the depths, still allow a nearer approximation of effect in the two situations. The object of using hard rays is to get an even absorption, or utilising an equal number of rays as they pass through the different layers of tissue to be treated, so that the therapeutic effect may be fairly even. It does not concern me whether the rays are hard or soft so long as they are absorbed in sufficient quantities in the spot that I want to treat.

With regard to the attitude of Professor Thompson and the desirability of using secondary soft rays, Professor Thompson said, in

talking about therapeutic action of the soft rays, that the effect was produced by the absorbed rays. Therefore he suggested that the soft rays should be used for surface conditions.

I think Dr. Argyle asked me about the general acceptance of Prof. Bragg's theory as to the nature of X-rays and gamma rays. Of course, I rely to a very large extent for my information on this subject, and for the authority on the subject, on Dr. Madsen, who, of course, is a Bragg man, and believes strongly in Bragg's theory. I do not profess to be sufficiently well up in physics to express a personal opinion of any weight, but it seems to me to be the most reasonable thing to believe in Bragg's theory, and, as far as I am able to gather from other physics men, I think that Bragg's theory is rapidly gaining acceptance from all the best physicists.

In regard to lympho-sarcoma, I have had very little personal experience with this disease. I first read about the thing, and then I asked several people, who told me they had several cases. One case was turned out of Prince Alfred Hospital; it was treated as a forlorn hope. It was sent down to the X-ray department, and, much to the surprise of everybody, the case healed, and has remained healed ever since.

I am very pleased to hear that Dr. Argyle has had some gratifying results with tubercular glands in the neck. I am very enthusiastic about the beneficial effect of X-rays in the treatment of tubercular glands.

I come to Dr. Clendinnen. I am pleased that he has called attention to this part of my paper. The whole object of my paper and my work in this connection for some time has been, not to prove that X-rays are better than radium, but that the nature and effect of the two rays are similar, that neither must be adopted to the exclusion of the other in the usual routine of work, but that both must be used for suitable cases, selected according to the various indications of surface extent and ease of application, &c., &c.

In that patient with extensive nævus, the application of radium to such a vast surface would have taken months and months, but with four exposures of X-rays it was possible to cover the whole area in a couple of hours, and the patient could come back and have it done again after three weeks. This could not be covered with radium in the same time, of course, unless you had a radium institute at your disposal. I was particularly pleased with that patient, and the patient herself was also pleased. I have no doubt that some of the members of Congress have also seen this case.

I thank you, gentlemen, one and all, for the very gratifying way you have received this rather controversial article.

ON THE VALUE OF RADIUM AS A THERAPEUTIC AGENT.

By CHAS. E. DENNIS, M.D.,

Honorary Skiagraphist to the Ballarat Hospital, Victoria.

I TAKE it that we are gathered together rather to hear and exchange opinions amongst ourselves than to launch out into discussions on the views of men of other countries, which we can each read at leisure in the medical journals.

Therefore, and especially with regard to the limited time at my disposal, I shall confine my remarks to my own personal experience in the use of radium as a therapeutic agent, and to the results that have attended my labours in that line.

In the year 1903 I first saw radium used therapeutically (to a case of "cancer en cuirasse," I think it was), at the Melbourne Hospital, by our President, Dr. Herman Lawrence, who is therefore to be congratulated on being one of the pioneers among radium-therapists, if not "the pioneer," on this side of the globe.

I had the good fortune to assist him for nine months in 1905, and again for a like term in 1907, in his work in Collins-street, and the brilliant results obtained by him with radium even then led me to procure a specimen of 5 millegrams when I started in Ballarat in 1908. Since then I have gradually augmented my supply, till I now have over 25 millegrams of the pure bromide of radium; little enough, it is true, but still sufficient to demonstrate the great possibilities of this most valuable and powerful therapeutic agent.

Of this, 5 millegrams are contained in mica-covered capsule, 6 in a thin glass tube, 6 on a varnish-covered applicator 2 centimetres square, 8 on a circular varnish applicator two and a half centimetres in diameter, and 2 on the tip of a probe-pointed rod.

These, when in use, I cover with thin rubber—old operating gloves are excellent—and fix on the patients with tapes.

In treating superficial lesions, as a rule no filter is used; but where the condition is deeper, and when it is desirable to cut off the softer rays which are more active in producing an erythema, I use screens varying in thickness from two layers of tinfoil to one-tenth of a millimetre thickness of lead, according to the nature of the condition to be treated, increasing the length of application in proportion to the thickness of the screen and to the amount of action desired.

Occasionally I have used lead screens 1 millimetre thick, giving very prolonged applications, in cases of inoperable carcinoma; but with so small a supply of radium as mine, the total irradiation then available—though in several cases markedly retarding the rate of growth of the tumour and giving relief from pain—is insufficient to cause retrogression and cure.

The erythema following radium applications of sufficient length, like that following X-ray applications, does not appear till an interval has elapsed. This interval is usually four or five days in length, but in exceptional cases I have seen it shortened to forty-eight hours. Also, like an X-ray erythema, it usually appears after a certain definite dose, but in a few individuals it appears after a much shorter irradiation than usual. This is, however, not common; but it is well always to bear it in mind.

This erythematous area is generally very itchy and somewhat tender to touch, but is not, as a rule, painful like an X-ray dermatitis; and even if ulceration be produced, it is not stubborn, though somewhat slow in healing over. Patients must be carefully warned not to rub or scratch the spot when it becomes irritable, as by so doing an ulceration may be caused, and the scar left is apt to be more evident. Also, the same result will follow friction by clothing, so that means must be taken to prevent this. I once saw a mild erythema thus transformed into an ulcer, which was kept up for six weeks, till the cause was discovered and removed.

The erythema, after a single dose, appears about the fifth day, and gradually increases for a week, and then takes a week more to subside, as a general rule.

Occasionally a temporary pigmentation follows the application, as is seen sometimes after X-rayings, but is of no consequence, disappearing in time. In treating benign conditions, such as *nævi vasculosi*, where cure can be obtained without the production of more than the mildest pink blush, the resulting scar—or rather “tissue of restitution”—is much less evident than if the cure is more rapidly brought about by larger doses, with severe erythema and crust formation. Therefore, when possible, it is much better to give short sittings only, at frequent intervals, so that a violent reaction can be avoided, if the best cosmetic results are to be obtained. In cases so treated I have never yet seen those disfiguring telangiectases one hears so much about, and which I rarely see except after severe reactions, or where ulceration has been present before treatment.

The site of a radium erythema seems never to be the origin of any infective process; but, on the other hand, when radium is applied to infective foci, such as boils, it appears to have a sterilising effect, causing the lesion to dry up as though a local immunity had been produced in the tissue irradiated. Hence its value in treating small localised infections such as boils, acne pustules, and indolent suppurating foci. The analgesic action of radium is often very noticeable, though not invariable. In one case of inoperative carcinoma uteri, where morphia injections had to be frequently given, the pain quite disappeared after treatment, and no further morphia was needed till the patient died. On the other hand, in an obstinate epithelioma over the parotid region, in which pain was severe and constant, no relief was obtained. However, here the ulcer lay right over large nerve trunks, and that may have accounted for the severity of the pain. This case was an exceptional one in that regard.

Often, after all trace of erythema has disappeared, retrogression of a tumour or *nævus* will continue for a very considerable time, even for one or two months or longer.

After applying the radium to discharging sores, there is often a slight increase in the discharge for a while, but this soon dries up, and the ulcer heals under a limpet-like crust. As a rule, it is best to apply no after-treatment, or at most to apply a little pure vaseline to prevent the scab becoming too hard and causing marking. Antiseptic applications seem generally to irritate if applied after radium

irradiations. The scar (tissue of restitution) following treatment is always soft, smooth, and supple, and especially after the slow method of treatment can scarcely be noticed, unless it is carefully looked for. If, however, there was an ulcerated area before or after treatment, the scar may be depressed, and the edges pink, with small telangiectases developing after a time.

With care, small *nævi* may be removed in children almost without any visible mark being left, even on close inspection. The suppleness and beauty of the scar left makes radium to be preferred in many cases where the condition is such that it is quite amenable to this form of treatment. In cases of rodent ulcers and the less malignant epitheliomas occurring in such situations as the inner canthus of the eye, on the lids, or on the ala nasi, where total removal by surgical measures is very difficult or impossible, and where such complete removal means a certain amount of disfigurement or interference with the normal working of the part, either directly due to removal of tissues or contraction of the scar, here it is that the beneficial results of radium treatment are to be seen. In such cases, after the disappearance of the growth or ulceration, even where there previously appeared to have been fairly extensive destruction of tissue, it is wonderful to see how the parts return almost to the normal condition after healing without any crippling of the part. I have treated a rodent ulcer extending to the free edge of the lower eyelid, and now I defy anyone to say at a glance on which side the growth was. I have never seen any interference with the lachrymal duct either, after treating growths almost occluding it. On the contrary, with removal of such a growth I have seen the duct which was obstructed again become patent. On the nose, too, where the ala has been eaten into by an epithelioma, after treatment the gap seemed to heal up without apparent deformity. In such cases how difficult it is, after so widely excising such a growth as to remove it completely, to satisfactorily cover the site by the most skilful plastic operation.

There has been much discussion on the supposed "selective action" of radium on certain living cells; but it appears to me that it is only a question of the survival of the fittest. The more delicate the cell the sooner it succumbs to the baleful effect of radium rays. For instance, the tough connective tissue can withstand, and possibly may be stimulated by, a raying that will modify or kill the more delicate cells, such as those forming secreting glands, or new growths. This is well seen in the ordinary wart, which will often quite disappear after a raying that will not cause even any erythema in the neighbouring tissues, and the more poorly-nourished epithelioma cells in a very aged person require much smaller doses than those in a younger person, where the growth is more vigorous.

All my failures, with three or four exceptions, have been in cases of epithelioma or carcinoma, and these were all cases which were either inoperable, refused operation, or where the growth recurred after operation.

In these cases failure may have been due either to insufficiently powerful apparatus for the size of the growth treated, or insufficient dosage with the supply I had, owing to the patients not attending

regularly, for in some the growth appeared to retrogress for a while, but eventually gained the upper hand; and I have no doubt that in several the progress of the case was delayed for months; and as also pain was relieved in a wonderful manner, I do not think all could be classed as complete failures, especially as treatment was only undertaken as a last resort. I feel certain that had I had double the supply of radium that I now possess one or two of these cases might have been cured. In all, they only number less than a dozen so far, not counting patients who have ceased to attend after one or two treatments, and have been lost sight of.

The following is a list of the conditions I have treated with radium:—Warts, papillomas, keratoses, moles (pigmented and non-pigmented), psoriasis, acne, hypertrophic and irritable cicatrices, lupus erythematosus, nævus vasculosus, rodent ulcer, epitheliomas, carcinomas, and one sarcoma.

I will now give an outline of the results obtained under each of these headings, if I may be permitted. I regret that I have had no means of scientifically measuring the dosage after the manner of Drs. Wickham and Degrais, of Paris, and therefore, as a rough guide, will adopt the suggestion of Dr. Dawson Turner, and give it in terms of milligram-hours, a milligram-hour being the dose resulting from the application of 1 milligram of the pure salt for one hour, or its equivalent—e.g., 6 milligrams for ten minutes. This is very inaccurate, however, as it does not take into account the area irradiated, and the nature of the applicator. However, it gives some indication of the dose used, and is easily understood by those accustomed to the use of radium.

It may also be well to mention that a single dose of, let us say, 10 milligram-hours is as effective as three separate doses of 5 milligram-hours spread over a week.

1. *Warts*.—The simple wart (*verruca vulgaris*), of ordinary size, can usually be removed with an application which is not sufficient to cause erythema—about a 2 or 3 milligram-hour dose. Larger ones may require up to 5 milligram-hours. About ten days after the irradiation the wart begins to disappear and melts away, so to speak, leaving no trace behind it. In a child who had regular bunches of warts on knee and elbow, following on abrasions, which appeared to have become infected with them, they all disappeared with one very mild dose, though at the time of treatment they were spreading. Non-malignant papilloma are also easily removed, disappearing after the manner of warts, but requiring a larger dose. I have never tried it on syphilitic condyтомата.

In a case of papilloma of the bladder in a gentleman aged 69 years, which had been removed once in April, 1909, and again in November, 1910, at the suggestion of Dr. G. A. Syme, of Melbourne, I placed a tube containing 6 milligrams of radium bromide, surrounded by six layers of tinfoil, and enclosed in the end of a Jaques catheter, through the drainage tube into the bladder after the second operation, and so irradiated the interior of the bladder for about seventy hours. After the first operation, when a single papillomatous growth about the size of a walnut was removed, recurrence was manifested in seven months' time by repeated hæmorrhages, and at the second

operation a tumour large enough to almost fill the bladder was removed. Dr. Syme thought recurrence would be certain to occur, and so suggested radium treatment. It is now over ten months since operation, and as yet there has been no sign of recurrence, though it generally appears at an earlier date after a second removal. Absence of recurrence is therefore probably due to the radium treatment, but, of course, is not certainly so.

2. *Moles*.—On the other hand, these require a destructive dose for their removal, about four times as strong as that necessary to remove a wart of equal size.

Flat pigmented moles require a slight ulcerative dose to complete decolourisation, and great care is required to effect this evenly, without causing too severe a reaction, and so spoiling the after-result, and yet so as not to leave any spots of colour behind. Dr. Mastotte, of the Hospital St. Louis, Paris, holds that there is no treatment which excels radium in pigmented nævi.

3. *Keratosis*.—Keratosis senilis and the brown-crust super seborrhic keratosis, so often seen on the faces of people past middle age, are easily dealt with, clearing up after a dose of from 10 to 15 milligram-hours, applied after the horny crust has been softened and removed. If there be any ulcer beneath the crust it is, however, safer to give a larger dose to ensure complete destruction of any epitheliomatous cells which may be present.

4. *Lupus Erythematosus*.—I have had good results in most of the cases, especially in those of the more chronic scaly type. Here large doses are to be given, sufficient to cause a smart erythema, and treatment must extend well beyond the affected area, the advancing edge being the most rebellious. The only case that resisted treatment was a woman whose face was terribly disfigured with a very severe type of about fifteen years' duration. She suffered with bad asthma and dysmenorrhœa, and at her menstrual periods all the affected area, cheeks, forehead, and ears, used to become acutely inflamed and bleed. In the intervals between the periods it would improve, only to break out again, but not quite so severely in the treated areas. Usually improvement is slow and requires patience, but the after-result is very good.

5. *Psoriasis*.—Spots rapidly disappear after about 1 or 2 milligram-hours usually, sometimes leaving a brownish pigmentation for a while. It is useful in dealing with chronic patches about the knees and elbows, and should give good results in psoriasis of the nails. It is a clean and rapid method of treating isolated spots, and I do not think they are so apt to return as after other methods of treatment.

6. *Acne*.—Here it is of value in the treatment of pustules, but more especially in the case of sluggish, cold abscesses and indurations (*acne indurata*), which are so slow to respond to all other forms of treatment. These lumpy, unsightly conditions melt away after a few doses of from 2 to 3 milligram-hours in a most rapid manner. Boils, pustules, and indolent sluggish ulcers are rapidly benefited by mild irradiations, the inflammation subsiding, and healing taking place in a most gratifying manner.

7. *Hypertrophic, Irritable, and Contracting Scars*.—These all respond well, irritation and redness disappearing, and cheloidal conditions flattening down, giving an admirable æsthetic result, especially if treatment is slow and no severe reaction produced.

I obtained a most excellent result in a case of very extensive scarring of the side of the chest and arm, following a severe burn with petrol flames. There were raised firm cheloidal bands, especially about the bend of the elbow, causing limitation of movement, which was getting worse and worse, in spite of massage, &c. Radium was applied along the bands, and X-rays over the whole area. Amelioration was very rapid and satisfactory, and after eight sittings the improvement was so great that the patient was quite satisfied. Now his arm is quite supple after two years, and he can follow his trade as a painter without being hampered at all, whereas before treatment he could not shave himself.

8. *Nævus Vasculosus*.—It is a pleasure to treat this disfiguring condition, because of the uniform and certain good result obtained, especially in babies and young children. In no case have I seen a nævus refuse to disappear, and have yet to see a scar in the cases I have treated disfigured by telangiectases. That may be because, whenever possible, I carry out treatment without producing more than the mildest erythema, giving mild doses at intervals of four or five days, thus obtaining a cure with the minimum dose necessary to do so. This, of course, can only be done if the patient lives near at hand, and, as a rule, if the advantage of the slow method is explained to parents they almost always prefer it to the chance of a bad cosmetic result. Moreover, if marked erythema is produced, with the inevitable itching accompanying it, a child is sure to rub and cause excoriation, and so spoil the after-result. The motto, "Festina lenté," I think an admirable one in dealing with cutaneous nævi in children. In adults, however, treatment may be more vigorous, as in them nævi are more resistant to treatment.

Most of my cases have been in babies and children under 6 years of age, the majority of the nævi having been of the smooth, raised, deep-red form, several extending more or less deeply, with a dark-blue colouration round the base; but all have done equally well, even one dark-blue subcutaneous one causing prominence of the cheek. The latter was treated by "cross-fire" method after filtering the rays through one-tenth of a millimetre of lead, only a slight pigmentation of the overlying skin being produced.

One of the largest treated was in a child 7 weeks old. The nævus was 3 centimetres long by 2.5 centimetres across, and occupied the left pre-auricular region. It was deep-red in colour, smooth, and raised above the surrounding skin. This was treated slowly, with two intervals, one of a month and one of three months, and the final result is splendid, all that remains being a slightly depressed area, a little whiter than the surrounding skin, which is becoming less evident as the child is growing. In this case the surgeon in charge proposed to operate, but finally decided the nævus was too deep and extensive, and refused to touch it.

Another, larger (3 x 4 centimetres in area) and deeper, situated over the nape of the neck and interscapular region in a baby, also gave an excellent result. When treatment was begun the nævus was excoriated and exuding serum, but this soon healed over with treatment, and the nævus subsided most satisfactorily, though the scar left is depressed and evident, on account of the previous ulceration. This nævus was too deep and extensive to have been excised satisfactorily, and there was danger of hæmorrhage from the ulceration unless treatment had been undertaken at once.

9. *Rodent ulcers* also are most satisfactory to treat when the ulceration is not very extensive, and does not involve bone. A small one requires, on an average, from 20-30 millegram-hours dosage, and the area treated should extend well beyond the apparent disease. I think it is better to give too much than too little treatment, for if treatment is stopped when apparent cure is attained the condition may recur; but in those cases to which I have given very vigorous treatment I have not yet seen a relapse. Recurrence in a scar seen early is easily dealt with, but I feel sure such is due to insufficient treatment, and should not occur.

In the case of a large rodent ulcer attacking the orbit, and extending to the bone, I had no success, but at that time my supply of radium was small.

10. The preceding remarks apply also to the vegetating, ulcerating, and nodular epitheliomas of low malignancy, with little or no tendency to form metastases, so commonly seen on the faces of people past middle age, which are often said to follow a scratch or an irritated papule, and which also occur at the base of keratoses.

The more rapid the growth of an epithelioma, and the more thickened and inflamed its base, the more vigorous should treatment be, and the more reserved the prognosis. Also, the younger the patient the worse the prognosis. Therefore I do not treat those in patients below middle age if the growth appears to be actively malignant. Epithelioma of the lips is very resistant, and on account of its situation it is difficult to fix the radium applicator in position for any length of time. I agree with Drs. Sequira and Dawson-Turner that it should not be treated with radium when excision is possible.

However, by this I do not mean those superficial chronic excoriations and cracks of the lip so difficult to heal, and without definite infiltration, for these do exceedingly well, but should be actively irradiated in case there be some early epitheliomatous element about them. It is well to remember the red border of the lip is very sensitive to irradiation, and an erythema is easily produced there, so it is best to warn the patient of this, as otherwise they are sure to get nervous when it appears. About three or four weeks after treatment the condition is healed soundly. I usually give from 15 to 20 millegram-hours dosage, and filter the softer rays off with two to four layers of tinfoil. It is best to give the dose all at once, and thus avoid keeping the lip sore for longer than necessary. Dr. Chevrier,

of Paris, also is of the opinion that radium is the treatment of choice in simple cutaneous epithelioma without ganglionic invasion.—(Arch. d'Électricité Méd., 10th July, 1910.)

II. *Carcinoma and Malignant and Recurring Epitheliomas*.—Of these I will not say more than that with a supply of radium as limited as mine they should only be treated as a last resource.

I treated such with a very marked relief of pain, and apparently in several instances kept the growth in check for months, but in the end they have gained the upper hand, though a couple of recurrences almost disappeared under treatment, one being a very active, rapidly-growing carcinoma of the scalp, which at last outdid the treatment. It had been twice excised previously, and had rapidly recurred.

I have treated several epitheliomas of fairly active nature, however, where surgical interference was contra-indicated or refused, with unexpected success.

Epitheliomas occasionally do unexpected things under treatment, but as a general rule I think we may say that the more chronic the growth, the less infiltrated its base, and the older the patient the more favourably does radium act on it.

The oft-recurring question, "Is radium a cure for cancer?" always appears to me a most foolish one, inasmuch as it takes no account of the varying degrees of malignancy of neoplasms, nor of the fertility of the soil they grow in—i.e., whether the patient is young or old, nor of the supply of radium available for treatment. The term cancer is an ill-defined one at best. Undoubtedly radium will cure neoplasms of low malignancy, but with the present relatively small amounts in use one can make no dogmatic statements with regard to the more malignant ones, though very encouraging results are obtained in inoperable conditions in Paris and elsewhere, where the supplies of radium in use are large. Also, effective supplies have not been in use sufficiently long for us to judge as to the permanency of the good results obtained in these bad cases. These remarks agree more or less closely with the experiences of Dr. Henry Butlin, reported in the *Lancet*, 13th November, 1909.

The dogmatic statement, "Radium is not a cure for cancer," usually emanates from persons who have apparently had no experience with it, or have been using totally inadequate supplies. However, so far I consider there is no justification for using radium in preference to surgical measures in active malignant conditions amenable to the latter form of treatment. Dr. Louis Wickham, Director of Radium Institute, Paris, contributes an article to the *British Medical Journal*, 18th December, 1909, on this question, based on the treatment of 600 cases in five years.

In conditions too extensive to thoroughly treat with radium, or in hospital practice where there are a number of cases to treat, it is useful to apply filtered X-rays as well.

I frequently use this combination, especially at the hospital, and find good results are obtained with smaller doses of radium, and a

greater number of cases can be treated. In rodent ulcers, for instance, the radium is applied to the thickened edge so resistant to the rays, and then the rays applied to the whole surface, the resulting cure being more rapid than by either method alone.

Of course the use of the X-rays would be of no advantage were the radium applicators of sufficient size and strength to deal with such lesions alone.

In a paper entitled "Radium in Superficial Lesions," in the Australian Medical Journal, of June, 1910, I reported a number of cases I had treated, and I refer anyone to that paper who wishes for details of cases.

Time will not permit of my dealing with the pathological aspects of radium treatment, and I may say that I have not had sufficient opportunity to make any investigations of any value in that line.

With regard to the danger of stimulating malignant growths to greater activity by inadequate irradiations, I thought it did occur twice, but it is difficult to say if it were so. Still, that it is a risk to be considered may be gathered by referring to an article by M.M. Delbet and Herrenschildt, in the *Revue de Medecine*, of December, 1909, read before the French Society for the Prevention of Cancer. In it they describe the action of radium on carcinomatous tissue, supported by histological examinations of the part before and after treatment.

They emphasise the selective action of the radium rays on carcinoma cells, but point out that if a dose insufficient to modify these cells be given it may merely stimulate the growth to greater activity; emphasising also the fact that the growth should receive evenly-distributed doses over its entirety, and that the amount of radium used and the length of dosage given should be sufficient to completely alter the constitution of cancer cells. All cases treated should, whenever possible, be kept under observation for some time after treatment before cure can be said to be accomplished, so that any recurrence can be dealt with at once if it appears.

This paper would be incomplete if I neglected to mention some of the more important conditions successfully treated by well-known men, but which I have not had the opportunity of treating myself.

MM. Louis Wickham and Degrais, of Paris, whose work is probably the best known to us, report success in chronic skin diseases, eczema, pruritis, lichenifications, cheloids, and leucoplakia, and also in gynæcology, where some excellent results have been obtained in inoperable carcinoma of the cervix and uterus, and in endometritis.

Madame Fabre, M.D., of Paris, in the Archives of the Rontgen Ray, 10th November, 1910, remarks that the palliative effects of radium in gynæcology are alone sufficiently interesting to justify its

employment, and sums up the beneficial results under seven headings, viz.:—

- (1) Marked diminution of pain.
- (2) Gradual diminution of metrorrhagia.
- (3) Disappearance of foetid discharge.
- (4) Regression of exuberant cancerous growth.
- (5) Increased mobility of the uterus as a consequence of diminished inflammatory exudation round it.
- (6) Amelioration of general health.
- (7) Diminution of anuria and cæhexia.

She uses application containing from 2·5 to 80 millegrams of pure radium salt, with nickel screen one-tenth and half a millimetre thick.

Dr. Robert Abbe, of New York, in the Archives of the Röntgen Ray, March, 1910, reports favourably on the treatment of leucoplakia of the tongue and mouth, and papillomata and epitheliomata of the larynx, and he holds that radium acts as a specific in myeloid sarcoma, and should always be used in that affection before having recourse to surgery. (New York Medical Record, 1st January, 1910.) Drs. Lawson and J. McKenzie-Davidson report a series of eye cases treated (British Medical Journal of 12th September, 1910), showing the value of radium in corneal ulcers, spring catarrh, and corneal scars.

Dr. Cheron, of Paris (L'Obstetrician, September, 1910), recommends radium in carcinoma of the cervix uteri, large doses being necessary to give permanent relief from pain and hæmorrhage, and to cause sclerosis. He and Dominici (Archiv. d'Elec. Med., 25th March, 1910) describe the treatment of deep-seated cancers by radium, and note that carcinoma of the rectum is the most readily dispersed of neoplasms of the digestive tract. They also had success with lymphadenoma and sarcoma by burying radium tubes in the growths.

Dr. N. S. Finzi, too, had some success in inoperable malignant growths, and finds success follows more frequently as larger quantities of radium are available. In such cases he even thinks 200 milligrams too small a quantity.

Other operators report good results in acne rosaceæ, mycosis, fungoides, trachoma, and pannus, and also in enlarged prostate, by irradiating the gland from the rectum and urethra with ultra-penetrating rays.

Several observers have had excellent results in syringomyelia, applying radium along the spinal column over the affected area of the cord, great benefit being manifested by loss of pain, with return of sensation and movement in the affected limbs. (Lancet, 22nd January, 1910.) Mme. Fabre and Dr. Paul Touchard, of the Salpêtrière Hospital, report five of these cases.

These results have been obtained by the application of radium salts fixed in tubes, or in some kind of applicator; but recently experiments with solutions, or, better, suspensions of insoluble salts, which are administered hypodermically into growths seem to promise even more brilliant results; and general disease, such as chronic rheumatism and gout, appear to be greatly benefited by radio-active baths, and by drinking radio-active waters, according to Professor Wilhelm His, of Berlin. For the relief of painful chronic arthritic affections, radio-active poultices appear to be very efficacious in the hands of Drs. Claude and Feulière, of Paris. (British Medical Journal, 12th March, 1910.)

Lastly, Drs. Bécléré and Haret, at a meeting of the Académie de Médecine, on 16th May, 1911, report very favourably on electrolytic introduction of radium ions into the tissues, using a solution of 10 micrograms of radium bromide per c.c. at the positive pole. The radium penetrates as far as 9 centimetres into the tissues, and marked success followed this method of treatment in a large sarcoma.

Dr. Alfred Jordan (Lancet, 11th December, 1909) describes an effective method of using the emanation for local applications, his results appearing to be highly successful.

That such remarkable results have been obtained since the first discovery of radium in 1898, notwithstanding the small amounts obtained and the tremendous price it commands, are indeed marvellous, and it is hard to predict what results will be attained a few years hence, when it can be more easily and cheaply obtained, and when the present method of obtaining the best results with it are improved on, as they are sure to be.

Even so far, if one reads carefully, it is remarkable how closely the opinions of the foremost workers agree on the main points with regard to dosage, results obtained, and contra-indications to the use of radium in disease.

DISCUSSION.

Dr. HARRIS : I would like to congratulate Dr. Dennis on his paper. I have been working with radium for about two years, in conjunction with Dr. Frank Bennet. We have had a good many cases between us, and, on the whole, our results agree with those of Dr. Dennis. I do not suppose Dr. Dennis means that radium is preferable to any other treatment in all these cases. I take it he means that, having radium, he uses it on all these cases. Take, for example, ordinary warts. So far as I know, the simplest and cheapest way to treat them is by carbonic snow. I certainly look upon radium as the ideal treatment for *nævi* of any variety. Some cases are more obstinate than others, but the ultimate results are very good.

As to epitheliomata, I think it is a very difficult question to decide whether they should be treated by radium or not. If they are treated by radium, I think one should use one's own surgical experience, or, not having any, seek the surgical experience of competent men. Always insist on the glands being removed.

If a patient refuse operation, or is too weak to undergo an operation, then it is right to use these methods, or any other methods. I certainly feel very strongly on the subject of treating malignant growths therapeutically.

If treated by radium, the glands should always be attended to, because I have seen hundreds of these cases operated on, and in nearly every case have I seen the glands involved, often when there has not been any outward indication of such being the case.

Frequently malignant cases are stimulated by radium. The stimulation has been due, in some cases, to the fact that the dosage has not been sufficient. In other cases the radium certainly appears to be harmful. I do not think that carcinomata are often cured by the use of radium.

One of the disadvantages of radium therapy is with cases living in the country. If the patients live in the city they can be seen frequently. If the patients live in the country there is the chance that we cannot see them, perhaps, for a year or two; they might not be able to afford to come to town. In these cases I think it is advisable to persuade the patients to submit to operation.

It is ridiculous to state that radium is a panacea. Those of us experienced in the use of the Rontgen rays know that practically what radium will do the Rontgen rays will do. Carbonic snow will do nearly all that radium will. We should use the cheapest and best method for our patients.

Of course one needs great experience in using the Rontgen rays properly. Not so with radium, which is a "pocket X-rays." The difference is the same as when one man sits down to play the pianola and another the piano.

Dr. ARGYLE (Melb.): I would like to ask Dr. Dennis whether he finds that radium is a satisfactory method in the treatment of these cases? Is it quicker, more certain, and less liable to recurrence than the other and older methods we have been accustomed to use; particularly I refer to the use of the X-rays? It seems to me that in discussing the value of a new method of treatment—which is still under its trial—it has to be very clearly established that practically in all cases it is better than the older and more established methods, as well as being more expensive; that it should be so established before these older methods are to be discarded. It is in that light I would like his opinion as to whether he has used these old methods, whether his results are better, quicker; are more permanent, and more easily obtained than they were by the older methods? The matter of expense should not enter into the question at all if it can be proved this method is better than the older and cheaper one. I am speaking generally on the question. I want to arrive at a

conclusion: what is the right thing to do in the right case, which method is the one which is going to be the most successful? What is there in common between all these methods, differing as they appear to do very widely one from another? I would like to hear some expressions of opinion as to whether there is not something in common between all these methods which have a definite effect upon both the diseased cell and the healthy cell, and which result in reaction, and finally ends in cure.

With regard to my own experiences with radium, I have chiefly used it as a secondary method to finish up cases where satisfactory results have been obtained up to a certain point, but which I honestly know are not cured. The disease is still present, and there, it seems to me, that radium may be extremely useful.

Another question is as to the dosage. Dr. Dennis gives his idea of the dosage he used, and Dr. Lawrence has shown us that he employs a different dosage altogether in these cases. How are we going to arrive at some reasonable basis in regard to dosage?

Dr. WATSON: Mr. President, with regard to the whole question of radio-activity, do you not think that it is time the profession dropped the antagonistic attitude prevailing between advocates of the two sorts of radio-activity, natural and artificial? At present there seems to be a disposition to put radio-activity derived from the natural source—whatever it may be, whether it be radium or some other radio-active element—against that derived from the artificial source, the X-ray tube. All competent physicists, leaving out the medical fraternity—for I beg to submit very few of the medical fraternity are competent physicists—say that the gamma rays produced in nature and the X-rays produced in the laboratory are identical in kind; but we must remember that gamma rays are caused in nature by two different elements, radium and actinium, and probably mesothorium, and X-rays are created by an enormous number of different varieties of tubes. The gamma rays of freshly-prepared radium of mature radium and of actinium are not identical in their activity, and in like manner the gamma rays of various X-ray tubes are no more identical amongst themselves or with those from the sources of nature. But I venture to assert that it is possible to the perfect technician, by time and patience, to reproduce in the laboratory by artificial means a X-ray similar to any given gamma ray in nature.

In all the other branches of the medical profession we always take the individual factor of the practitioner, both as regards diagnosis and treatment, and, of course, results. Well, I beg to submit, if anything in medical practice depends more upon the personal factor, then it is treatment by the X-ray tube; if anything requires accurate technique, it is X-ray therapy. When we hear of contradictory results, blame not the artificial radio-activity used, but the technique of the operator. Just remember that if you ask a large number of X-ray operators what tube they use they cannot tell you what it is, or what penetration it has. By the competent technician, an X-ray tube can be kept almost constant. As an example of this, one man

I was working with in Vienna, who is perhaps the most competent technician in the world, used to test the tubes at the beginning, and brand them, after which he almost invariably kept them constant for a long time; but for fear this might fail, or that he might have failed himself in technique from being overtired on any one day, he used to test them again in a fortnight. The difference between radium and X-rays, then—if an operator knows his apparatus, has the best apparatus, and can work absolutely with precision—seems to me to vanish. Why, then, the constant innate antagonism?

The only difference, as far as I can see, between radium and X-rays is that with radium any Tom and Dick and Harry can use it, after, of course, it is tested in the laboratory by the physicist, and the radio-active strength is known; whereas X-rays requires a very efficient technique. Radium has the great charm that a man has not to go back to what you might call school days in order to learn its application; he can pick its therapy up in two or three days after seeing it in use at Sydney Hospital or any other institution, whilst with the X-rays I do not think a man can learn the rudiments of its technique without six months' close daily study of the apparatus and methods.

Let each form of radio-therapy be used by the profession in cases most suited to each method, and abandon the custom that seems to be growing of booming radium at the expense of X-rays.

Dr. NEWLAND: Dr. Dennis has dealt with the question of radium so fully that if I read my paper it would be needlessly taking up the time of the Section; but I would like to refer to one point which has not been dealt with, and that is the value of radium in the treatment of pre-cancerous conditions of the skin. There is no doubt, I think, that it is not generally recognised by the profession as a whole that keratosis is a frequent cause of cutaneous cancer. Therefore every case of keratosis cured is a possible case of cancer prevented. This is not recognised by the profession at large, although most dermatologists are perfectly aware of this fact. Until the profession at large is cognisant of it it is unlikely that the public will see the importance of it.

I have treated within the last few months thirteen cases of keratosis, or leucoplakia of the lip. They have responded very satisfactorily indeed to radium, and I have no doubt that these cases, if left alone, would in the course of a few years have developed into epithelioma of the lip. My practice is chiefly surgical, and I try to look on things from a surgical point of view; and, looked at from that standpoint, I have no doubt that eventually they would have led to the development of cancer of the lip. It seems to me that it is a very debatable point whether radium is a definite cure for cancer. There is no doubt it is a very valuable factor in the prevention of it.

SOME DIAGNOSES WITHIN THE SCOPE OF SMALL APPARATUS— AND A NEW FORM OF TUBE.

By C. A. EDWARDS, L.R.C.P., E., &c., &c.

I AM placing before you in a very short paper a few clinical facts that were brought to my notice by means of the ray. I should have much diffidence in showing such apparently simple matters to so august an assemblage of my brethren were it not that experience teaches us that the smallest contribution from the least learned often sheds a little light that may, in abler hands, lead to more important revelations.

Some years ago I was specially interested in rheumatoid arthritis, and coming across a couple of marked cases in Sydney where, by the way, it is comparatively rare, or at any rate much less common than in Europe, I took a skiagram to see what changes I might detect. The results are before you, and I must confess that the changes observable in the joints are here so very clearly marked that an early diagnosis might be clinched, so to speak, by resort to the ray.

The modern treatment of the disease so ably defined in another Section is not for my comment here; but if I have drawn attention to a method of seeing early the changes mentioned, eburnation, &c., and so saved even a little uncertainty in some cases, I feel that I shall not entirely have wasted your time.

The next case I am showing is of an entirely different character, though much on a par, as far as its exposure by the ray is concerned.

It occurred to me that the very persistent character of the ulcerations that one finds on the legs of the old, and sometimes of the middle-aged, due undoubtedly to a poor circulation and general want of tone, might possibly show some changes not entirely recognised. I examined a great number of cases, and in all I found marked inflammation of the periosteum immediately under the sore or sores.

The history of these cases mostly includes a blow, generally involving what our fathers called a "solution of continuity," sometimes not even that; but the persistence of the ulcerative process led me to look for some change that was not in the wound itself—whether this periostitis is *post hoc* or *propter hoc* I would rather ask you to determine. But one fact I proved conclusively, viz., that the amount of inflammation as disclosed by the plates is directly proportionate, up to a certain point, to the time which the ulcer has persisted.

The next illustration is, I think, of much interest. The patient, a navvy, working within a mile of my house, came to me complaining that a week previously he had been hit on the shin by a pick. There was only a slight bruise externally, and at the time he thought little or nothing of it; but the pain getting worse daily, and his feeling, as he called it, "terrible weak," he was advised to seek advice.

There was little to see externally, but some flushing over the middle third of the tibia—I placed the limb behind the screen and saw clearly the condition as shown. Sent him to hospital, where immediate operation was advised. He refused to be “cut up,” and died within a fortnight of my seeing him.

I would point out that without the aid of the ray the condition would not have been suspected, for at least a time, and he most certainly would not have had so early an opportunity of surgical assistance. That he would not take advantage of the help offered is beside the question.

Those, gentlemen, are the cases I have brought here, not only as of interest in themselves, but to emphasise this point, viz., that this work was done, or could be done, with a very modest apparatus, and did not involve any of the more elaborate technique. Any practitioner with a 6-inch coil and a corresponding current, small or medium tubes, could without difficulty or very prolonged practice compass this kind of work, and I therefore bring these cases forward as illustrating the important and interesting achievements attainable by a moderate equipment in the hands of any medical man who may be inclined to take up X-ray work, not necessarily as a speciality, but as a most helpful adjunct to his armentarium.

The manifest advantages of a simple and inexpensive apparatus for the production of the ray is my excuse for showing you the little tube on the coil. As you see, it is of the ordinary shape, and is a trifle over 6 centimetres in diameter; but the disc receiving and reflecting the cathode rays, instead of being of metal, is in this case of willemite, silicate of zinc. I was struck by the behaviour of this mineral under a high vacuum, and Cosser, of London, exhausted a tube with a pure specimen. I found that any aspect of this Cosser tube gave a ray capable of sharp definition on the screen, and peculiarly good for plate work. I had not the means of making a tube here, and sent to a maker explaining that I wanted a willamite reflector for the cathode stream in lieu of the usual platinum. Unfortunately I was not sufficiently explicit in my minor details, and I received a tube with a very inferior specimen of the mineral. But even here the passage of the current shows a very bright fluorescence, and the screen gives a feeble picture. Unfortunately again, the tube became damaged, and it was the great courtesy of Dr. Madsen, who placed his time and beautiful pump, &c., at my disposal, and so enabled me to show you this tube. I have taken ordinary hands, arms, &c., with the tube quite easily, and the great point about it is that a toy coil of, say, 2 inches spark, is ample to produce the full effect. I am sanguine enough to hope that at our next meeting I may be able to place before the Congress a reliable tube that shall prove of solid value where only small instruments and current can be used. The price of the tube itself should be small.

DISCUSSION.

Dr. STRAHAN : I wish to thank Dr. Edwards for his paper. In reference to the apparatus, it was interesting. There is no doubt about it that certain metals will cause phosphorescent rays of some degree of power, and I dare say in time something may be evolved in technique which will put the apparatus on a practical useful basis, and it would be very valuable, because it would reduce the cost of the apparatus to the country practitioner. I wish to thank Dr. Edwards for putting it before us.

Dr. ARGYLE : I was very interested in Dr. Edwards' paper. It struck me several times that the question of the metal on which the target was based was one of very great importance.

With regard to the quality of the rays that emerge in connection with a Tantalum tube, I am quite satisfied with the quality of rays with a very small current, on a very low voltage, which in an ordinary tube would produce a ray of medium penetration but with very much less electrical energy apparently, a ray of greater penetrating power is produced by the Tantalum tube. I am rather surprised that this has not exercised the minds of scientists who produce the X-ray tubes, so that in the light of the remarks of Professor I. I. Thomson, of Cambridge—and there is no greater authority on matters of electricity than he—in regard to its passage through rarified gases that a variety of tubes might be produced for therapeutic purposes, especially the treatment of malignant diseases, in order that we might get a maximum of penetrating rays, and a minimum of those rays which affect the skin. In this direction the future may offer something valuable in the treatment of malignant diseases.

I am very much indebted to Dr. Edwards in making those suggestions. I might say personally I am not able to do anything more than make the suggestions that I have made.

In talking about the general practitioner it seems to me that a very inexpensive and cheap plant could be produced for the general practitioner in the country. I think a 4-inch coil, an 8-volt or less, 6-volt, or even 4-volt, accumulator, properly worked in the hands of a man who knows how to use it, would be quite sufficient.

Dr. AYRES : I would like to thank Dr. Edwards for bringing forward his interesting paper. It ought to be impressed upon general practitioners that they ought to know how to protect themselves from the effects of the rays, which many of them do not know. I have been very often surprised to hear that many gentlemen do not know the effects upon the body by the exposure of X-rays. It is absolutely necessary for them to use great precaution.

Dr. HARRIS : I would like to congratulate Dr. Edwards. I think he is rather too modest; he is a scientific man, and he does not give us enough of his work in Sydney; but I dare say, being such a busy man, and having such a big general practice, he has not too much time to devote to this subject.

Concerning protection, I think with the means we now possess of protecting ourselves there is very little to worry about. I certainly think if we do not use it ourselves we should make our assistants use a complete set of armour to ensure complete protection.

Dr. CLENDINNEN : I wish to thank Dr. Edwards for taking the trouble to come along here and show us all this apparatus and tubes. The display was very interesting; but I might say, as regards that willamite tube, willamite is one of those substances that will fluoresce, under the influence of the X-rays, cathodal and ultra violet rays.

I would like to know if Dr. Edwards has taken any radiographs with this tube. This willamite will fluoresce under very slight induced current, working at $\frac{1}{2}$ inch or less, and it will also fluoresce in an ordinary vacuum tube, or where there are any cathode or ultra violet rays present.

I would like to thank him again.

Dr. EDWARDS : In the country it is a very wise thing that they should have some protection, and if something simple could be evolved it would be of advantage.

With regard to the danger to the general practitioner and the effects of the rays: For very many years I have been working for my living with these X-ray tubes, and although I have been using them for so many years, night after night, I have never had the slightest trouble. I regret I did not bring a radiograph taken with the willamite tube. I have several. I thank you all for the kindly remarks about myself and the paper.

X-RAY INJURIES.

By P. CLENNELL FENWICK, M.D. (N.Z.), M.B. (Lond.), F.R.C.S.E.,
F.R.G.S. (Christchurch, New Zealand.)

THE fact that severe injuries can be inflicted by the X-ray is now so well recognised and guarded against that X-ray burns will soon be as rare as old-fashioned gangrene, that used to be the terror of the hospital surgeon in pre-antiseptic days.

During the last seven years I have seen eleven cases of X-ray burns, and I thought it might interest the Congress to see these cases as recorded in wax models.

With reference to these records I hope it will be recognised that they are merely amateur efforts to accurately record the appearances of the cases as seen from time to time.

In some cases it is possible to take a plaster-cast and reproduce this in wax, but in many the wound is so tender that, to secure accuracy, it is necessary to trace the outline of the wound on oiled paper laid over the injured area.

With regard to the colouring, let me say that bizarre and glaring as some of the records appear, the colouring is accurate. I am not satisfied with any record unless it "matches" the colour of the patient's wound. My colleague, Dr. Inglis, has scrutinised each model before I have passed it as correct.

My list of cases ranges from a simple bullous dermatitis, which I produced myself on a patient after 200 and more exposures, to those of the worst character.

The first case taught me that even in patients who have been for months under treatment there is no such thing as immunity; the latter cases, which I am thankful to say were not produced by myself, emphasised the truth that one exposure of undue strength or length may cripple the patient for years.

Dr. Harris has so kindly undertaken to demonstrate to you the wax records, each of which is explained by the notes attached, that I need not relate the cases at any length.

I wish to draw your attention to two important points only. The first is the pathological question of the nature of the burn; the second is the treatment which I have used, and I believe used successfully.

My experience of several severe, and in some cases fatal, burns following X-ray exposure has led me to believe that the effect of an overdose of the rays is to cause total or temporary death, or rather paralysis of those nerves which are responsible for the life of the skin and underlying tissues. They are often called the trophic nerves, and their function appears to be both vaso-motor and of some peculiar nutritive character.

In each case watched by me I have been struck by certain facts, which I may tabulate as follows:—

1. The wound was surrounded by a margin of a dark colour, formed by congested capillaries. Pressure on this margin slowly emptied the vessels and paled the colour, and as slowly the vessels refilled and the colour returned. This is

in marked contrast to the healing margin seen in ordinary wounds, where the colour is bright and the vessels empty and refill rapidly on pressure. It appeared to me suggestive of vascular stagnation, as if the vaso-motor apparatus was at fault.

2. The fact that, unlike a burn caused by heat, the injury does not appear immediately after exposure to the exciting cause. As in cases of facial paralysis, there is a distinct latent period before the nerve shows the reaction of degeneration; so in X-ray burns there is a latent period which may extend over a week or more before the skin "dies" and the wound is apparent. This seems to me significant of some nerve injury, which shows itself by the loss of vitality in the skin, which is dependent upon this set of nerves.
3. The apathy of the wound: For months I have closely watched two cases of deep X-ray burns, and the sullen and lifeless appearance of the wounds was most striking. That there is some circulation in the "slough" over the surface of the wound is proved by the bleeding which occurs when an effort is made to incise the slough.
4. The absence of any attempt on the part of nature to form the ordinary granulations which are so noticeable in ordinary wounds. In all cases but one (which was under treatment) the wound has closed by slow contraction of the surrounding skin, and in none except the one noted has any granulation tissue been formed. Contrast this with a healing burn where the base of the wound is a mass of succulent granulation tissue.
5. The intense pain which is felt. First a preliminary itching before the skin dies, as if there was extreme irritation of the superficial nerves, and later the constant pain limited to the area of the injury. Even the touch of a draught of air upon the wound, which was covered with thick slough, was sufficient to make one of my patients scream. It does not seem illogical to surmise that the sensory nerves are over-excited, while the so-called trophic nerves, perhaps being of a finer fibre, are destroyed by the electrical effects of the rays.

I have often been struck with the resemblance between an X-ray wound and a bed-sore in a paralysed patient.

Every surgeon has noticed that a very slight abrasion may rapidly develop into a deep and intractable sore, and it is accepted that this condition is dependent upon the paralysis of the spinal nerves.

Treatment.

I think I may truthfully say that, with the exception of radium, I have tried every reported form of treatment.

Of the eleven cases I have had four died. In one of these, a case of disease of the nipple, I used the high-frequency effleuve empirically, and was rather astonished to find that it gave distinct relief to the pain.

In case No. 6 I used no treatment except this, and the records show that not only was the pain controlled from the first, but steady improvement set in, and the wound is now healed.

In case No. 7, which occurred at the same time and under the same circumstances as case No. 6, I used the effleuve for about three weeks, and the records show what rapid improvement occurred. I regret to say that the patient, thinking he would be burdened with expense, stayed away, and when I persuaded him to return for treatment his condition was appalling. Under treatment he is again improving, and is in a better condition than he has been for months.

My sole reason for using this form of electricity was that I was convinced that the injury was due to nerve injury, and as in cases of faces of facial paralysis persistent treatment may eventually restore the nerve to life, I was determined not to relax the treatment as long as the patient consented to come. Case No. 6 has had over 140 treatments of five to fifteen minutes' duration, and he has healed.

I hope that my amateur models may prove of interest to the Congress, and much regret that I am prevented from attending myself.

NOTES ON ABOUT TWENTY THOUSAND CASES TREATED BY X RAYS.

By HERSCHEL HARRIS, M.B., C.M. (Syd.).

Hon. Radiographer Royal Prince Alfred Hospital, Sydney Hospital, Royal Alexandra Hospital for Children, and the United Dental Hospital of Sydney; late Assistant Surgeon, Sydney Hospital.

As the medical pioneer of X-ray work in New South Wales it has been my lot—shall I say good fortune—to come across a tremendous number of cases of all varieties.

Complete records have not been kept of them all, but I may mention that at the Sydney Hospital alone, up to January, 1910, the recorded figures show as follow:—

	Cases.
Fractures and dislocations	3,792
Other injuries to bones	3,102
Diseases of bones	415
Localisation of foreign bodies	1,720
Renal and vesical cases, with 148 positive findings	1,427
Chest and abdominal cases	376

And one item alone on the therapeutic list includes—

Rodent ulcers	520
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Add to this about 1,500 cases treated at the Royal Alexandra Hospital for Children, some hundreds since I have been connected with the Royal Prince Alfred Hospital, and some thousands of private cases, and you will, I am sure, believe me when I say that the remarks I am about to make are based on the experience of over 20,000 cases, with most of which I have dealt personally.

In the 1900 report of Sydney Hospital the following paragraph appeared under the heading of the "Skiagraphic Department":—

A large number of cases have been subjected to the rays for the purpose of revealing the presence of calculi in the urinary tract if such happened to be present, and the results obtained have been very satisfactory and reliable; a calculus, the size of a small pea, having been revealed in the kidney in one case, and subsequently removed by operation.

Advantage, too, has been taken of the therapeutic uses of the Roentgen rays, and patients daily attend the department to have the rays applied for this purpose, and so far the treatment has been most successful, and there is every indication that during the next year or two a very wide field will be opened up in connection with this branch of the science.

I had no idea that such uses would be found for the rays as we know exist at present.

What, then, can we predict for the future?

It is my intention in this paper, roughly, to summarise to some extent the cases that have passed through my hands, with a few remarks thereon.

FROM A DIAGNOSTIC POINT OF VIEW.

The Bismuth Meal.

By this method a large field has been opened up whereby certain œsophageal and gastric conditions may be diagnosed. I always employ the oxychloride of bismuth and administer it either mixed with oatmeal, to which sugar is added, or else encased in capsules of various sizes.

The capsules are extremely useful in cases of œsophageal stricture. Sometimes a very small one will pass through a stricture, whereas a larger one will be arrested at the site of the lesion.

Another method is to have the meal mixed with milk of different dilutions.

In the liquid form it will pass readily into the stomach, and when the meal is of thicker consistence it will be seen to trickle through the obstruction in very much the same fashion as an egg-boiler.

It should be mentioned that with the capsules the patient must be made to swallow water once or several times, as there is often a tendency for the capsule to stick in the upper part of the œsophagus.

An instantaneous radiograph will reveal the most perfect result in some of these cases.

I often find that a metal chain or œsophageal bougies of different sizes filled with small shot are of very great service for œsophageal examinations.

One case recently exemplified this. It was a question whether the patient had an œsophageal diverticulum or an hour-glass stomach. He was given a bismuth meal, and then a bougie filled with shot was passed down 20 inches.

An instantaneous skiagram was taken, and revealed the bougie in the stomach; the stomach itself was of normal shape, and a large diverticulum was apparent above the diaphragm. This was further verified, for an abdominal section was performed, and everything was found to be normal.

Subsequently an œsophagoscope was passed, and the diverticulum was seen.

The left posterior oblique position is the best for œsophageal examinations.

The diagnosis of gastric conditions is not attended by the same amount of certainty as the œsophageal cases.

I do not think the X-ray picture itself should be relied upon for a diagnosis. It should be considered in conjunction with the signs and symptoms. The screen examination should be relied upon entirely, and the patient should be standing up.

An average meal consists of 8 oz. of oatmeal, with 2 oz. of bismuth, and sugar to fancy.

Opinions vary as to the appearance of the normal stomach. This is hard to define, as not any two appear alike. In over 100 examinations the stomach has assumed the shape of the letter J placed almost entirely to the left of the middle line. The pylorus is about half an inch above the lowest point, which is about the level of the umbilicus, and half an inch to the right of the middle line.

I generally employ certain landmarks, and with this object I place small pieces of sheet lead, each the size of a sixpence, and covered with Z.O. plaster, over the umbilicus, the xiphisternum, and the anterior superior spines.

There is generally some air in the fundus, known as the "magen-blase."

As a rule, a bismuth meal leaves the stomach within four and a half hours.

In cases of atony the shadow of the meal appears low down, sometimes on a level with the pelvis, and the peristaltic movements are feeble. Often it is a good plan to stroke the abdominal wall a few times to excite peristalsis. If this fail it is generally indicative of some organic trouble.

In cases of pyloric obstruction the peristalsis is generally excessive, and the bismuth meal is present longer than five hours. Sometimes some of the meal is found present even after twenty-four hours. In these cases marked obstruction is generally present. As a general rule, food is found to reach the cæcum in four and a half hours after injection, and the hepatic flexure in six and a half hours.

Hour-glass constriction can generally be diagnosed by the shape of the shadow produced. The peristalsis in the upper compartment is generally excessive, and often the food is seen trickling through to the lower compartment.

These are the main conditions revealed by a bismuth meal.

I generally examine a case at intervals for periods up to twenty-four hours. In some cases five hours will suffice.

Examination of Thorax.

Considerably over 1,000 of these examinations have been made, mainly by means of the screen. Almost with certainty aneurisms are detected. Sometimes it needs some careful discrimination to decide between a dilated arch and a normal arch on the one hand, or an aneurism on the other.

In large saccular aneurisms of the ascending arch the heart has generally been observed to lie obliquely or almost transversely. It is a debatable point whether this is due to the act of gravity forcing the base down, and consequently tilting the apex up, or due to the fact that a generally dilated arch is also elongated.

Since the descending thoracic aorta is fixed in position against the vertebral column, it is the aortic arch lying free in the thorax whose position will alter. Consequently, as the arch elongates the commencement of the arch will take up a lower position in the chest, so much lower that in some cases the heart appears to be actually lying upon its right side, with its long axis practically horizontal.—(A. C. Jordan, M.D.)

Some of the prettiest pictures seen are those produced by hydatids. These are very easily detected, and when ruptured are globular.

When they are ruptured, and the patient is in the erect position, the upper level of the cyst shadow is always seen to be horizontal. If the patient be tilted this horizontal line still persists.

This point is very important, for by means of it one can discriminate infallibly between a ruptured and unruptured cyst. It was first pointed out by Dr. MacCormick, of Sydney.

Often an empyema has been correctly diagnosed when a needle failed to draw off any pus. Effusions generally cause little difficulty. Effusions with new growths have sometimes been more troublesome to interpret.

The examination of these cases should always be made after the effusion has been drawn off.

Six cases of sarcoma of lungs have been diagnosed this way, and two cases of gumma. A Wassermann reaction has assisted in the latter diagnosis.

I have only come across one case of pneumothorax. The light area was distinctly seen, and corresponded with the physical signs.

The results in cases of bronchiectasis have not been so satisfactory.

In cases of phthisis the results have been uniformly very satisfactory.

It is still questionable to my mind whether the screen will reveal early tuberculosis before the stethoscope. Anyhow, tubercular lesions have often been clearly seen and located.

In my experience the movement of the diaphragm on the affected side is decreased, but not to such an extent as is spoken of in some text-books.

Foreign Bodies.

It is most amusing to look back on the variety of foreign bodies that have been located in various parts of the body. One may truly say, from the proverbial needle to a sheet-anchor.

Hundreds of cases have had portions of a needle in some part or other of the body. I have not yet come across a case where a girl has swallowed a needle, and hundreds have been found subsequently in various parts of her body. These cases generally originate in the lay press.

One of my most interesting cases was that in which a youth inhaled a metal collar-stud. This was located in the right bronchus, and an instantaneous skiagram was taken. It was subsequently removed through the bronchoscope.

Children appear to be rather partial to swallowing coins, generally halfpence. In over thirty cases these have been found stuck behind the cricoid cartilage, and have been readily removed by means of a coin-catcher.

Other foreign bodies have comprised trinkets of all sizes and varieties, buttons, nails, glass, bullets, screws, marbles, whistles, tacks, safety-pins, pieces of steel, corkscrews, brooches, &c., &c.

Mention should be made of an infant who swallowed a safety-pin point upwards. A skiagram revealed the pin half way down the œsophagus. An operation proved unsuccessful in this case, and later on the child was removed to my surgery, the X-ray tube placed under a table, and the screen above. A gum elastic catheter, into which a stilet had been previously introduced, was then employed. It was passed into the œsophagus, and down to the pin. Its passage was distinctly seen. It was then made to push the pin downwards into the stomach, and the infant subsequently passed it. Had this not been done the child would certainly have died.

The aptly named "deadly" pea-rifle furnishes a very large number of cases in all hospitals and in private. In my experience most harm has been caused through the suppuration, due either to the foreign material which has been carried into the wound with the bullet, or due to the subsequent searching with a probe. I feel sure that in these cases the adage, "Let sleeping dogs lie," should be observed.

I can picture very many cases of people walking about with bullets in their bodies and not suffering any inconvenience as a consequence. Why, then, interfere and try to remove the bullet just to please the relatives, or even the patient? At the best of times a bullet is very difficult to find, mainly because it is usually embedded in bone. My final advice is, "Unless trouble is being caused by its presence, leave it alone."

I cannot say that the various localisers have proved of much avail in these cases.

If necessary, stereoscopic views may be taken, but as a rule a very accurate idea is gauged by means of the screen.

After the first incision is made in searching for foreign bodies the position of parts alters, due to the elasticity of the tissues. This must be remembered, and therefore it is always better to make a fairly large incision, one that will admit a finger, and often this will be the means of finding an object which otherwise might not have been discovered.

It is curious how quickly a needle will become discoloured after once it has entered the tissues. Every one I have seen removed, no matter how soon after its entrance, has been blackened. This is due to the formation of a sulphide.

Foreign Bodies in the Eye.

The method I employ in these cases is very simple, and the results are very accurate.

A skiagram is taken of the affected eye, and, before doing so, a small piece of lead, pointed at one end, is attached to the lower lid by means of some Z.O. plaster.

The pointed part projects over the centre of the pupil, and, as far as possible, the point corresponds to the centre of the pupil with the eye in the normal position.

When the skiagram is taken and examined, the position of the foreign body may be approximately gauged by comparing its shadow with that of the pointer. This roughly gives the antero-posterior position.

The lateral position is roughly gauged by the clearness of the shadow cast by the foreign body. A clear definition means that it is near the plate, and consequently towards the outer side of the eye.

According as the definition vanishes the greater is the distance of the foreign body from the plate, and consequently the nearer its location to the inner part of the eye.

Of course some practice is needed to interpret these cases, but in my experience the results have been excellent.

Over 100 cases have been localised by this means, the majority at the Moorcliff Eye Hospital, and so far not a single mistake has been made.

In the majority of the cases the foreign body has been removed, and frequently the sight of the eye saved.

By this means quite recently a piece of steel, the size of a grain of sand, was removed successfully at the Royal Prince Alfred Hospital.

Sometimes doubt exists as to whether the foreign body is in the eyeball or the orbit. If so, I make it a rule to act as follows:—Two skiagrams are taken on the one plate. The head remains stationary during each exposure. For the first exposure the patient looks as high up as he can, and for the second he directs his eye as low as possible.

If the foreign body be in the eyeball two shadows then appear on the plate, whereas if it be in the orbit only one shadow will appear. The only fallacy is if the foreign body be in the centre of the eyeball. This, so far, has not happened in my experience.

Diseases of Joints and Bones.

Most valuable information has been afforded in these cases. In my experience practically every known case of bone disease has been radiographed. Sarcoma is much more frequent than is suspected. Altogether, I have come across thirty cases. They have all been endosteal, excepting one which was periosteal. The periosteal form is evidently rare.

Only once have I come across a case of coxa vara. This disease is very rare in New South Wales.

Congenital dislocations are quite common. Over and over again the cases have been missed, and treated for acute anterior poliomyelitis.

Tubercular disease of bone is not revealed in a very early stage. Such has been my experience. So far skiagrams cannot be taken with sufficiently fine detail to reveal the exudation stage of this disease. This especially obtains in hip-joint disease.

In cases of some little standing the diagnosis can be made, but I never place too much confidence on a negative diagnosis in an early suspected case. I have several times been deceived by such cases.

In three cases I have discovered hydatid disease of bone. A spontaneous fracture had occurred in each case.

Ten cases of osteitis deformans have been collected. This disease is not at all uncommon here. In early cases it is difficult to discriminate between it and syphilis.

Mention may be made of one interesting case of osteitis deformans that was skiagraphed. One femur only appeared to be enlarged. Other parts of the body were skiagraphed, and subsequently one of the meta-carpals was found to be similarly affected.

This tip may be worth remembering when dealing with doubtful cases of this nature.

Very many cases of syphilitic disease of bone have presented themselves. These cases make the prettiest pictures of any bone lesions.

The humerus (lower end) has been affected more than any other bone; the clavicle in one case only.

Regarding fractures and dislocations little need be said. It is generally recognised by everybody, be he layman or medical man, that every severe case of injury to bone should be skiagraphed. If possible, two views should be taken of each case, as one view will often show a fracture when the other does not. This also obtains with reference to the position of fragments. Stereoscopic views give very great assistance in such cases.

So far I have dealt with over 4,000 cases of fractures and dislocations. These cases are of grave consequence to all concerned, as so many court cases arise out of them. In fact, I may mention here that the work of the radiologist is generally of a most anxious character, as he is held responsible for his diagnostic or therapeutic results, and as a rule he gets but little credit for his successful cases, and much blame and abuse for any errors he may make.

Examination of the Genito-Urinary Tract.

Somehow the majority of my private cases are sent for the above purpose. Altogether, in hospital and in private, I can number considerably over 3,000 cases, I feel sure. The results are now generally very accurate. Perhaps, if I state that the percentage of mistakes numbers one I shall be very near the mark.

There is little to add as to technique since I read my last paper on this subject. The newest appliances, however, enable us to revolutionise the work of a year or two ago, and no patient is too stout now to be radiographed. My record patient was a medical man weighing 19 stone 10 lb. A calculus was most clearly seen in his right kidney, and the exposure was only eight seconds.

Just think of the early days, when half an hour to an hour would be devoted to an exposure for detecting a calculus in a thin patient; a stout patient was considered an impossible proposition! Now we measure our exposures in seconds.

I always employ the compressor diaphragm of Bécère, and I consider it the best we have so far.

Again, and once again, let me exhort you to always take the whole urinary tract. I can remember about fifty cases in which I have detected a small concretion lying at the lower end of the ureter, and often causing pains simulating renal calculus.

Often, when I discover an ureteric calculus, am I asked my opinion as to operation procedure. This, of course, is a very difficult point to decide. In more than half the cases small ureteric calculi pass on without interference.

In one case where the calculus, the size of a millet-seed, was causing very severe pain, preventing the patient from following his occupation, I advised removal, with a satisfactory result.

To be brief, I think in these cases the best advice is to hasten slowly. If the small concretion is not doing any harm or causing any pain, wait; but, on the other hand, when there are signs of obstruction and severe pains, then I think surgical interference is called for.

I am often worried over the differentiation between ureteric calculi and phleboliths. Since I first called attention to this fallacy in the *British Medical Journal* some years ago numerous articles have appeared on this subject. It is often a great stumbling-block. If it can be arranged, catheterisation of the ureters will clear up this point.

The question of recurrent calculi is of very great interest.

In my humble opinion, the cause of such conditions, as a rule, is due to the fact that something has been left behind at the original operation. Certainly, in some few cases, phosphatic concretions form after a kidney has been opened and a calculus removed, but I feel sure that in the majority of cases all the calculi were not removed at the time of the original operation.

It might often be expedient to admit a patient to a Roentgenographic examination after being operated upon for a renal calculus. I am afraid that a few surprises would result, especially in cases where a number of calculi have been present in the kidney, and, after all, we can all realise how easily this may happen.

As to vesical calculi, not so many cases come for examination, as there are so many means for detecting this condition.

Anyhow, the procedure is so simple, accurate, and painless that many medical men and patients prefer this method to any other. Always let us remember that phleboliths are often present in the pelvic region, and we must differentiate between them and calculi. I must admit that very often it is an extremely difficult thing to do. I feel sure that men are more prone to calculous disease than women. This, at any rate, is my experience.

It should be remembered that calculi, especially in the ureter, are liable to move. On this account, when an operation is to be performed, I make it a rule to skiagraph the patient immediately beforehand—that is to say, within twenty-four hours. I always think that in these cases the operating surgeon should be able to obtain assistance from the radiographer as to the easiest route to adopt.

There does not appear to be any definite locality in New South Wales predisposed to calculous disease. They come to me from all parts. What surprises me is the rarity of the disease in children.

An excellent paper has been written by Professor Benjamin Moore, of Liverpool University, on the "Chemical Composition and Mode of Formation of Renal Calculi."

The analyses were made from cases drawn from a wide area where the water was soft, and contained practically no calcium salts. In his opinion gravel and renal calculi more often lead to infection of the kidney than primary kidney infection leads to renal calculi.

He forms the opinion that the formation of renal calculi has for its basis a condition of diminished oxidation, in which there appear primarily calcium salts of incompletely oxidised bodies, such as calcium oxalate and calcium urate, associated with calcium phosphate.

Further, such diminished oxidation occurring locally or generally is seen in many pathological conditions, such as calcium salt deposition in bone in old age, in tuberculous lesions, in gout, in arteriosclerosis, and generally in calcification processes in the body. The tendency towards such deposition increases with age, and is probably accompanied by an increased alkalising of the body fluids.

This latter statement certainly bears out my experience, viz., that calculi in children are rare.

In a series of calculi examined by Professor Moore he found calcium oxalate in all but two, and in large percentages too, only one containing less than 30 per cent.

The next most abundant ingredient was tricalcic phosphate, a very insoluble calcium salt. They mostly all contained a very low uric acid percentage.

Even with a normal calcium metabolism, therefore, if oxalic, phosphoric, or uric acids begin to be formed in increased amounts it may be expected that they will commence to be deposited as calcium salts; at the same time there is little doubt that in case of deposition of such acids from such dilute solutions as are present in the body fluids, any concentrating of the kation, calcium, will

increase the tendency to precipitation, and cause an increased rate of deposit, other things being equal. Therefore, in recommending diet after removal of calculi containing calcium salts, it would be rational to interdict or diminish foods rich in calcium, such as milk, milk biscuits, milk puddings, &c., cheese, the whole meal of wheat and oats.

Many wines, especially the commoner varieties, contain calcium salts, added in the process known as "plastering." Most malt liquors contain calcium salts. All the heavier wines, as well as alcohol in general, have the defective quality of decreasing the rate of oxidation in living tissues, and hence tend towards that incomplete metabolism which gives rise to the oxalates and urates.

The treatment by alkaline waters is generally useless in such cases, the benefit of spa treatment being due rather to the enforced exercises than to the waters.

Calcium exalate and calcium phosphate are more soluble in acid than alkaline media, the alkaline treatment of lithiasis being based upon the solubilitus of the supposed preponderating uric acid and urates. For some considerable time now I have come to the conclusion that most calculi contain calcium salts, for if it were not so I feel sure that the results would not be so accurate as they are, and very many would not be detected at all.

I think the importance of the above statements points to the necessity of having a thorough analysis made of every calculus removed, and treating the patient subsequently according to the result.

Gall Stones.

Twice only have I been able to detect gall stones, and each time the diagnosis has been confirmed by subsequent operation.

Gall stones are difficult to detect, because cholesterin does not cast a shadow. When shadows of them are obtained we may feel sure that calcium salts are present.

FROM A THERAPEUTIC POINT OF VIEW.

Leukæmia.

Some most interesting results have been obtained in the treatment of this disease. Most cases that have come under my care have been of the spleno-myelogenous type. The lymphatic type is rare. Altogether I have treated about twelve cases, all with some benefit, and some with remarkable benefit.

The most successful case is that of a child who was treated at the Royal Alexandra Hospital for Children six years ago. At intervals she returns for treatment, and when last seen was very well.

My plan for some time now is to radiate the bones chiefly, and the enlargements later. This is viewing the condition on a par with malignant disease, with the primary focus in the bones, and the metastases in the glands. Later the glandular enlargements, including the spleen, are irradiated. A filter of aluminium is employed, and a full Sabouraud dose is applied daily, if possible, to the large bones in succession. The blood-count is watched, and when marked improvement follows the secondary enlargements are attacked.

When the white cells drop to about 12,000 I usually stop treatment, for a while at all events.

The patient should be kept under close observation, monthly blood-counts being made, and any sign of an increase should be followed by a fresh course of X-rays.

Sometimes it has been observed that if the spleen be irradiated to start with a severe toxæmia may result. This may often be avoided by attacking the bones first.

I prefer arsenic to be knocked off during treatment with the rays, as sometimes this assists to produce or accentuates the toxæmia. Arsenic seems to produce leucolytic substances similar to the rays, and the latter are not then so well under control.

Arsenic, I think, is of use when the rays have ceased for a time to act. It may then be administered, and so help, if possible, to carry on the work of the rays. Some cases respond to treatment better than others. It is rather much to look for a cure, but great relief is usually afforded, and life thereby may be greatly prolonged.

Hodgkin's Disease.

Hodgkin's disease responds well, as a rule, to X-ray treatment. Many cases have shown excellent results. One case, which had been operated upon in Adelaide and recurred, and subsequently was sent to me for treatment, has remained well for seven years.

Tubercular Adenitis.

Since the last Congress, held at Melbourne, my views have changed somewhat regarding the treatment of this disease. At the same time I still think that, as far as possible, surgical interference is to be preferred. Failing this, many excellent results are to be obtained by employing X-rays, and in early cases I think it is quite justifiable to adopt this form of treatment.

Irradiation for chronic discharging sinuses yields splendid results.

Carcinoma of the Breast.

I shall briefly summarise my results by quoting from a paper on the subject by Russell H. Beggs, M.D., of Pittsburg, Pa. I am quite in accord with his statements:—

“Under the influence of the Röntgen rays, used as a palliative remedy, glandular involvement has melted away; ulcerated masses have healed over; adherent tumours have become movable; some inoperable cases have become operable; rapidly-growing carcinomata have assumed a more schirrous type; lymphatic pathways have been sealed against extension, and a fibrous wall has been erected against further growth; life has been prolonged and redeemed from misery.

“Post-operative treatment has diminished scarring, promoted healing, postponed or prevented recurrence.

“Such results demand not only technical competence, but judgment, clinical knowledge of both the disease and the remedy, promptness, energy, and courage.”

I shall not enter fully into the discussion of the irradiation of operable cases, either before or after operation.

Personally, I prefer that the surgeon should rely upon his own resources, and do his best without falling back upon the X-rays to finish his work.

Such an attitude is liable to produce poor surgery, and the life of the patient will thereby be jeopardised.

Goitre.

I have had several successful cases of goitre, which have responded admirably to the rays. This treatment was preferred to operation. Cystic goitres are unsuitable for such treatment.

Regarding exophthalmic goitre, some cases improve greatly if the rays are employed early enough. The rays should, even then, only be an adjunct to other forms of treatment.

Then again, as a pre-operative measure, I feel sure that the rays may be often employed with advantage.

The only objection I find in such cases is that the thyroid becomes more adherent to the trachea than it otherwise would be.

Rodent Ulcers.

Hundreds of such cases have passed through my hands, and the results are generally very good.

Hospital results, naturally, are not as good as private ones, simply because the patients will not always attend as directed for treatment, and report themselves at intervals, if necessary.

For some years my plan has been to curette as much of the involved tissue as possible, and then to apply pure carbolic acid. Irradiation is then started.

Full doses are given once a week for several weeks, and in private I generally finish up with a filtered full dose.

Each case is judged on its own merits, and the treatment may be modified accordingly.

Ringworm of the Scalp.

Since the late Dr. W. J. Munro and I treated the first case at the Sydney Hospital in 1897, about sixty-five cases have been treated by me.

Following Sabouraud's method, the scalp is irradiated in five places, and by this means the whole scalp is treated. The results have always been excellent, and so far no untoward result has happened.

To this number I may add twenty private cases, all of which have been equally successful.

The hair usually returns thicker, and with a tendency to be wavy.

Keloid.

The method adopted is practically the same as that I advocated when reporting the first case ever treated. Several reactions are produced, till the scar-tissue disappears.

Sometimes pure carbolic acid is applied, which greatly assists these cases in reacting.

Not any other method will produce better results than the X-rays, properly administered.

Time prevents me going into much detail respecting other cases treated, but they include keratoses, which are most amenable to irradiation; dermatitis of different varieties; pruritus, lupus vulgaris and erythematosis, acne vulgaris, which also respond well to treatment; eczema, psoriasis, warts, chronic ulcers, lichen planus, sycosis, and hyperidrosis.

I have had several successful cases of this last-mentioned condition. In short, I think it may briefly be said that generally skin cases that do not respond to other forms of treatment do well under X-ray treatment.

Method Adopted for Therapeutic Work.

For some years now I have employed the pastilles of Sabouraud for measurement of my doses. I am able to rely on them implicitly, and measure fractions of doses by comparison with Tint B., so that if necessary I can administer one-third of a full dose, and so on, when necessary.

This is useful in many cases, only care must always be taken to enter the individual doses in a book, and before each fresh dose is administered to add up the preceding ones.

The pastilles I always keep in a petrie dish, exposed to the sun. By this means they regenerate, and are kept clean, and may be used over and over again.

I consider that all therapeutic doses should be measured, and not administered in the slipshod fashion of five minutes a day or ten minutes a day, as some men prescribe them, and as we even now see recommended in some of the latest text-books.

How on earth can we know what dose the patient is getting? Why, the tube may be inert!

As to filters, I employ many varieties. Felt paper, leather of various thicknesses, aluminium usually about one-third m.m. thick, and silver of about equal thickness. The last two filters are admirable.

Professor Barcla declares that the silver radiations are similar to the Beta rays of radium. Certainly the results are good.

It is surprising what large doses patients stand when the rays are filtered. I still, in these cases, employ my pastille the opposite side of the filter.

I often have been surprised to find rapid reactions in some of my cases, usually unfiltered ones. They may be termed "precocious reactions," and occur sometimes within a few hours of the application. They pass off rapidly, and the true reaction comes on about the tenth day.

Remarkable to relate, that out of the thousands of therapeutic cases treated during the past thirteen years I have never had a case of "acute" burn. Some have developed telangiectasis, especially the earlier ones, and is it to be wondered at?

Daily sittings of ten minutes each, continuing for weeks or months; tubes of any variety, and at any distance. The only wonder is that all the early cases were not burned. And here let me mention a very important point. I have always made it a rule to under-dose my hospital patients, so as to maintain a safe margin. We can take greater risks with our private patients, as we have them entirely under our own supervision. Not so in a large hospital department.

This, too, accounts for private results being better as a whole than hospital results. Another factor, too, and a very annoying one, is that frequently hospital patients discontinue treatment before they should, and often are lost sight of till they return months after and say they have a recurrence.

The "*selective action*" of rays is over and over again referred to. It always seems to me to be stretching the imagination too far to imagine that abnormal cells are singled out by rays of any description. It is far more rational to argue that when a particular lesion is being rayed all the cells come under their influence, and suffer more or less; but the abnormal cells have not the same recuperative power as the healthy ones, hence the result that follows a reaction.

In the X-rays we may truly claim to have a marvellous therapeutic, surgical, and medical aid, and if conscientiously used, and not abused, we may look forward to still more wonderful results.

DISCUSSION.

Dr. ARGYLE (Melbourne): I wish to say that this is one of the best papers that have been placed before us. It is a pity that a paper like this was not read earlier. I feel sure all of us will look forward to the opportunity for perusing it in print. I think that from the very vast store of his information Dr. Herschel Harris must sometimes smile at some of the opinions which are often expressed by some of us who are very much junior to him in the handling of patients with the X-rays. When we count our cases by hundreds he must have had thousands, and I suppose there are few men in the world who have had a wider experience in the treatment of cases that come under the control of the radiologist. I am not going to attempt to discuss his paper; it is impossible to do so; but I would like to say that I differ a little from Dr. Harris in connection with the bismuth meal. My experience has been that very much longer than five hours is necessary. I have not followed out the question very fully, but I would ask how long does Dr. Harris think it should remain in the stomach? My usual practice is, in giving the bismuth meal, to make an examination about eighteen hours afterwards. With these few remarks I simply express my very great thanks for the paper, which I hope we will all study later on, when it is published.

Dr. MOLESWORTH (Sydney): I should like to thank Dr. Herschel Harris. I may say whenever I want any information I always ask Dr. Harris, who is always ready to supply it. As far as the therapeutic work is concerned, I wish to thank Dr. Harris very much for the help that he has given me in the past, and for the great excellence of the paper and the enormous collection of cases. When I look back and see the huge number of cases he has had I cannot but feel very humble indeed in viewing my own work in contrast to his vast experience.

Dr. CLENDINNEN (Melbourne), President of the Section: I would like to extend my congratulations to Dr. Harris for this valuable paper. As Dr. Argyle said, it is a pity it was not brought on earlier. Dr. Harris, as we all know, is the pioneer of X-rays here, and has done a lot of very valuable work, and these cases and collection of statistics he has will no doubt under-rate what he has done. I have never seen anything like it before. There is no man who has done the work Dr. Harris has done. Dr. Harris has given us all some very valuable hints from time to time in the work. He has always been willing to help and give assistance to others, and I desire to thank him for the wonderful paper he has given us.

Dr. HARRIS, in reply: I thank you very much for the very nice things you have said. I do not know whether I deserve them all. It simply happened to be, shall I say my good fortune, to have handled these cases, because sometimes I regret having taken up X-rays for several reasons. I think our aim should be to work well together as much as possible.

It has afforded me the greatest pleasure to have acted as secretary to our worthy President, Dr. Clendinnen, who is one of my oldest and dearest of friends. To him I owe much, and I always look upon him as my first coach.

In the early days when I was a resident at the Sydney Hospital, and Dr. Clendinnen would visit this State, he would invariably call on me, giving me many valuable hints, and enthuse me. This I shall never forget.

I must apologise for the length of my paper, and even now I assure you that I have considerably curtailed it.

In conclusion, I think we can all congratulate ourselves on the very pleasant and amicable discussions that have followed our papers on radiology.

XII.

SECTION OF LARYNGOLOGY, RHINOLOGY,
AND OTOTOLOGY.**PRESIDENT'S ADDRESS**

By W. N. ROBERTSON, M.B., C.M. (Edin.), Brisbane.

MY first duty and privilege is to thank you for the honor you have done me in electing me to the position of President of this Section. I felt the greatest trepidation in accepting, for many reasons; but when I reflected that the honor was meant more for my State than myself I took heart of grace. It is my misfortune that I have never, until now, been able to be present at an Australasian Medical Congress, so that I must needs lean heavily upon the good nature of the Secretary for direction in matters of procedure. With your generous support and his efficient help I am sure we shall have a profitable meeting.

I am not altogether at one with the idea that the position of President inevitably predicates a presidential address, and, with the consent of the committee, I propose to place certain observations before you for criticism and discussion.

When one is as keenly interested as I have been in these matters it is difficult to avoid a certain amount of bias in favour of one's own conclusions, and I trust you will not spare me if you differ. I am only anxious to obtain all the light possible, and that truth only may prevail. The subject I have chosen has interested me keenly for a good many years, and as I would like to think that I have really initiated some work in the treatment of the paroxysmal neuroses, I venture to submit that subject to you.

In his work on megrim and sick headache, published in 1873, Liveing has applied the term paroxysmal neuroses to a number of conditions of a recurrent nature, of which megrim, asthma, angina pectoris, epilepsy, gastralgia, &c., are types. That these conditions are all dependent upon some basal factor has been proved by the writings of numerous observers. Further, that these neuroses are capable of alternation has also been amply demonstrated. It therefore seemed profitable to inquire what this fundamental basal principle is, or if there is more than one. As many of you are aware, I have more particularly been concerned in attempting to cure or modify these affections by intranasal interference, but at the same time I have not been blind to the fact that this method of treatment, whilst producing quite startling results, and results never before

obtained, is but treating symptoms, and not eradicating the vicious entity that lies at the root of the matter. That intranasal treatment can profoundly modify or cure asthma is, I think, proved beyond doubt by the fact that in 1,500 cases treated by H. A. Francis, and close on 1,000 treated by myself, not more than 10 per cent. have been unaffected by treatment. I think that I can demonstrate that the other neuroses are similarly affected by like treatment.

Whilst the limited time at my disposal will not allow me to enter fully into the literature of this subject, I might mention that most interesting material may be found in the writings of Liveing, Lauder Brunton, Haig, James Mackenzie, Salter, Fleury, Trusseau, Ewart and James Adam, and more especially Francis Hare. Here, I am proud to say, that it was in Queensland that much of this work originated. It was in Brisbane that Hare's work was written, and in Brisbane also Francis elaborated his work. Hare has collated an immense amount of material from the writings of these authors, and many others, which he uses to confirm his theory that these neuroses are of vaso-motor type, and that they primarily depend on a hyper-carbonisation of the blood through excessive carbonaceous absorption. He has demonstrated that all of them can be modified or cured by strict attention to diet. This, of course, in itself is strong confirmatory evidence of the association of these complaints in one group. My experience of their treatment by intranasal methods confirms this opinion.

On consulting various works on diseases of the nose, one finds that there is considerable scepticism regarding the role played by the nose in these various neuroses, and little is said of their relationship to each other. Few, again, accept the vaso-motor nature of the mechanism. Of asthma, Kyle defines a "reflex neurosis of the nose" as a "phenomenon having its origin in nasal excitability or nervous instability." "For the production of a reflex act there is necessary an afferent sensory nerve, an efferent motor nerve, and between them a vague nervous mechanism called a reflex centre." "Owing to the introduction of the sympathetic system into this mechanism, the impulses may be altered and modified—e.g., an impulse started as purely motor may arrive at its destination as vaso-motor."

He divides the nasal neuroses into sensory, motor, trophic, and vaso-motor; further into neuroses of the respiratory tract, and neuroses affecting other parts of the body. Without giving a very complete list of affections that have been from time to time associated with nasal conditions, he gives a very cautious agreement with that association. It is interesting to note that, referring to asthma, he postulates that "three essential elements exist in every case of asthma—a sensitive area of the mucous membrane, sensitive nerve centres, and an internal or external exciting cause—*i.e.*, while there may be sensitive areas, and certain local predisposing causes, there must be some underlying systemic etiological factor either in faulty secretion or elimination, or some organic structure."

Parker says: "Asthma is occasionally associated with intranasal disease, and is relieved by nasal treatment; it is therefore probable that persistent nasal irritation may be the exciting cause of asthmatic attacks in people predisposed to them."

He also gives a long list of reflex neuroses, which he divides into "nasal reflexes" and "referred reflexes." Watson Williams, whilst agreeing that many cases of asthma have been relieved by the treatment of obvious nasal abnormalities, states that "in no sense is there any justification for the recently advocated uniform cauterisation of definite spots in the nasal passages as a specific cure for all cases of asthma." Of course one does not claim this.

Seth Bishop says: "The theory that lesions situated in the nasal cavities may be responsible for the existence of common asthma is generally accepted," &c. Further, he says: "The arrangement of the nervous supply of the respiratory passages is favourable to the existence of reflex nervous phenomena. One sympathetic nervous centre, the sphenopalatine ganglion, supplies branches to the lining membrane of the nose, pharynx, and eustachian tubes. It has a motor, a sensory, and a sympathetic root. It communicates with the facial and pneumogastric nerves, thus uniting in the closest connection the nose pharynx, middle ear, larynx, and bronchi.

St. Clair Thomson says: "To be nearly positive of a purely reflex neurosis we must avoid attributing too much to a merely anatomical irregularity, and have absolute clinical proof—(1) that the symptoms can only originate in the nasal mucous membrane; (2) that they can be completely arrested by applying a 10 per cent. solution of cocaine to the parts; (3) that they can only be finally cured by direct treatment of the offending area."

Bosworth, who first drew attention to the association of nasal conditions and asthma, says: "A large majority, if not all, cases of asthma are dependent upon some obstructive lesion of the nasal cavity."

It is unnecessary to quote further authorities in this connection. It is evident that there is a feeling, held more or less strongly, that in the nose there is a point or points on which hinge certain reflex neuroses. By most it is held that it is necessary that there should be some departure from the normal in the shape of shelves, spurs, polypi, or deflections, or some point that shows undue irritability when touched. Only two writers, to my knowledge, assert that no obvious abnormality is necessary to associate the nose with these neuroses—Dr. H. A. Francis and Dr. Pierre Monier. Most of you are familiar with Francis' work. Dr. Monnier, in a rather diffuse paper in *La Revue* claims to have had quite startling results in numerous obscure conditions by treatment on all-fours with that of Francis. He, however, goes much further, and even maps out the exact area to be attacked in each particular affection. He states that the bulb is the centre of all these disturbances, and that it can be directly influenced by cauterisation of the nasal mucosa. He says: "There is a whole list, unhappily little known by doctors, of profound troubles, such as epilepsy, asthma, giddiness, powerlessness, monthly troubles, incontinence, psychic troubles, that one sees disappear as the result of a small nasal intervention, which, however, only aimed at the nose itself. I add the divers forms of anxiety and enterites, &c." He recommends light cauterisations, "which can produce considerable effects, and happy ones, on the bulbous

centres." He says: "We must know where to cauterise. The more the nervous centre is situated low in the bulb, the more the part of the nasal nerve to be touched is situated forward in the nose. Thus, for treating urinary or genital troubles, monthly troubles, incontinence, &c., the best is to cauterise quite forward near the orifice of the nasal holes, either on the mobile under partition or under the wing of the nose, even on the anterior part of the septum, avoiding the artery, or yet again on the head of the inferior trumpet.

"In mounting from front to back along the inferior trumpet you can modify arterial tension, cardiac phenomena, vascular troubles, hæmorrhoids, hepatic congestion, &c." And so on.

In this way he enumerates a treatment for dyspepsia, colitis, renal troubles, hypochondriasis, nausea, giddiness, buzzing and congestive deafness, asthma and allied neuroses, many eye troubles, epilepsy, exophthalmic goitre, &c., &c.

He further mentions megrim, neuralgia, muco-membranous enteritis, constipation, and neuresthenia, with illustrative cases submitted to him by leading French physicians. He gives a record of 800 cases treated in three years.

After an experience of nearly twelve years in the treatment of these neuroses, I am satisfied that much more can be done than is admitted by most observers, though I cannot claim to have obtained results in such a wide series of troubles as is quoted by Pierre Monnier. Possibly that is the result of faulty observation on my part or lack of opportunity. I am convinced that the results I have obtained are sufficient to indicate that a great therapeutic factor is available, which, if thoroughly investigated, is capable of immense benefit to the suffering public. I think I can prove that cauterisation of the nasal mucosa is capable of producing a profound effect upon the vaso-motor regulating centre.

In an address read before the Queensland Branch of the British Medical Association in 1905, and published in the *Australasian Medical Gazette*, January, 1906, I advanced this postulate: "That cauterisation of the septal mucosa, after the method of Francis, acts exactly in a similar way to a dose of nitrite of amyl, &c." That was before I had an opportunity of mechanically measuring the blood-pressure. Now, with the help of the syphgmomanometer, I have been able to prove a definite fall of blood-pressure after cauterisation of the septal mucosa. I have records of a case whose blood-pressure fell from 210 mm. of hg. to 165 mm. after four cauterisations, and many other cases less striking. This means, to my mind, a relaxation of vaso-constriction, or an equalising of blood-pressure all over the body. I have records of cases of asthma, hay fever, epilepsy, migraine, laryngismus, stridulus, spasmodic cough, giddiness, angina pectoris, gastralgia and flatulence, dysmenorrhœa, and persistent high blood-pressure all modified or cured by this procedure; so I think I am free to conclude that there is one great nasal factor implicated in these phenomena, and further, that these complaints have one basal pathology. And it is in the hope that light may be thrown upon this obscure problem that I asked to be allowed to open a discussion rather than give an address.

What are the factors at work in the development of a reflex nasal neurosis? I hold that there are three. Firstly, a vicious humoral condition induced by defective metabolism, either katabolic or anabolic. Secondly, an unstable nervous system, either sympathetic or vaso-motor. Thirdly, a switchboard in the nose, which is capable of diverting deranged nerve currents into correct channels.

Hare, in his work "The Food Factor in Disease," ingeniously, and, as I think, conclusively, proved the first factor. He has demonstrated that these neuroses can be lessened or checked by cutting down the carbonaceous intake. He also shows how the organism disposes of the excessive intake in those cases where the neurosis is abated by change of climate, nasal treatment, or drugs, without curtailment of diet. Patients gain in weight by a deposit of fat, or they change their particular neurosis for another carbonising process. That has been my constant experience in the treatment of asthma. Cases where the asthmatic paroxysms have ceased as the result of nasal interference, frequently put on several stones in weight, and I always look upon a gain in weight as an indication that the neurosis will be overcome.

I have also records of cases where the asthma changed to headache, which was eventually removed by subsequent treatment, and fat formation induced. The fact that these neuroses usually, one might say always, occur at the time when absorption is at its highest and combustion at its lowest strongly confirms his hypothesis. Further, the attacks are periodic, indicating that the organism carries on until a point of saturation is reached, when the explosion takes place. That increased exercise will defer an attack or abort it if not too well established, points to defective metabolism or excretion.

Coming to the second factor, the unstable nervous system, one feels that this is a hazy, unsatisfactory term, but is the best I can think of to describe that tendency, hereditary or acquired, to these neurosal storms.

There is no doubt that heredity plays a very large part in these neuroses. It may be argued that heredity may run on the lines of a faulty chemistry; but I have seen so many cases of asthma, &c., follow attacks of dengue, influenza, and other debilitating disease, that I am convinced that an irritability or degeneration of the nerve centres is a powerful contributing factor.

I am satisfied that dengue and influenza do their worst by damaging the nervous system, either centrally or peripherally.

That the third factor is vital in the great majority of cases is, I think, proved by the great array of cases that I can bring forward in demonstration thereof.

In looking through my notes I find that I have treated 947 cases of asthma, besides a large number seen at the Hospital for Sick Children, the records of which are hard to get at, and therefore not included. I may say here that my impression is that the results are not so good in these children, though many have got well.

Taking my last note on each case, I find recorded that 616 were well, 256 were improved, and 75 show little or no improvement

This last includes a large number of polypus cases, in which I find the results are not so good, even though all polypi were removed and offending sinuses dealt with.

There is no doubt that certain of the "well" cases relapsed, especially after the incidence of dengue, but many of these also were restored to health by further treatment.

These figures, reduced to decimals, mean that nearly 65 per cent. of these cases got complete relief from asthma, whilst under 9 per cent. showed no improvement. I may say that I circularised all those patients of whom I did not know the subsequent history, but the replies were so few that they were valueless for the purposes of this paper.

I may say that it is difficult to convince one's medical brethren of the efficacy of this treatment, as they only see the failures. Of hay fever cases I find fifteen out of 123 no better; whilst in the bulk of the cases my notes only record "better," which is not explicit enough for tabulation, though I know of my personal knowledge that many of those labelled "better" are quite well. Of periodic headache cases I find that only seven got no relief in fifty-eight cases that were treated for that ailment alone. Many other cases have been incidentally relieved of this complaint whilst under treatment for other affections.

In headache the most striking results have followed treatment in those cases of the migrinous type, occurring periodically. These headaches are ushered in by a feeling of irritability and languor and auræ of different types. The more common take the form of "spots before the eyes," fortification spectra, and other visual phenomena. Occasionally, as in other neuroses, the patient feels particularly well and jolly just before an attack. Success has been achieved also in cases of almost constant headache. In these cases it is usual to find some pressure point in the nose, either in the shape of a spine or shelf, or hard contact between the middle turbinal and the septum.

Sinus cases, of course, constantly complain of headache.

It has been a great disappointment that cases of angina pectoris do not come my way more frequently. I have been able to find records of twenty-one in my notes, and of these only two have apparently been unaffected by treatment. Usually relief has been very prompt, but in a few cases it has taken some little time. Quite recently I had under treatment a woman about 45, kindly sent to me by Dr. Espie Dods, whose case is interesting.

She had experienced an unhappy married life through intemperance of her husband. In addition to the worry, she had to work very hard, until two years ago she became unable to do so on account of frequent anginal attacks, when she became the recipient of Government relief. After the first cauterisation she was able to sleep on her left side, which was quite impossible previously. Gradually all the precordial pain disappeared, with the pain and numbness in the arms, and now she can sleep and walk uphill in comfort. She used frequently to be quite unable to sleep with the

pain, tingling and numbness in the arms and hands. It is interesting to note here that at the same time her daughter came under my care for almost constant headache. She had a thickened septum, with which the middle turbinates were in contact. Reduction of the turbinals, with relief of the pressure, was followed by relief from the headaches.

My first case was of the greatest interest to me, as the patient was a near and dear relative of my own. From three attacks a day he got prompt and absolute relief after the first cauterisation. That is now eight years ago, and he is a hale man of 71 now. During the last two or three years he began to get a "tightness" in the precordial area, which is always relieved for a time by a cauterisation, but recurs. I asked my friend, Dr. A. J. Turner, to sketch out a diet for him, and under that regime, adhered to more or less closely, he enjoys excellent health.

This case is interesting, as his blood-pressure is low (under 100), and he stands nitrites badly; in fact, they make him ill.

In two cases the cauterisation has induced an attack at the time, but was followed by complete relief.

In one very bad case of asthma with cardiac trouble, touching the left side of the septum induced a slight attack of angina on two occasions, whilst touching the right produced no effect. The patient eventually was relieved of asthma, and had no recurrence of angina either.

One interesting case was sent to me by Dr. Love for the treatment of tinnitus aurium of an intermittent nature. On taking her history, I found that she was subject to severe attacks of angina pectoris. Several treatments to the nasal mucosa secured complete relief from the anginal symptoms, and from the aural symptoms also.

It is needless to note that cardiac lesions are a fruitful source of perverted auditory phenomena.

Incidentally I might mention that I have lately had marked results in tinnitus in cases of paracusis, treated after the method of Charles Heath. Whether that is a reflex from stimulation of the auricular branch of the vagus, or purely the result of counter irritation, I am unable to say. Certainly the result is very prompt.

To pass to gastralgia: I may say that my first observations on the effects of nasal treatment on this condition were made upon cases associated with asthma. In many asthmatics the first indications of an attack are distension of the stomach, with some pain, and frequent and noisy eructations. Now I constantly found that, as the asthma disappeared under treatment of the nose, so also did the gastric symptoms. This, to me, points the moral that there is no gastric asthma, renal asthma, &c., but all are asthma pure and simple, accidentally, one might say, associated with the other conditions.

I have only been able to secure the opportunity of treating a few cases of gastralgia unassociated with other neuroses, but have had pleasing results so far.

Here I might be permitted to give a little personal history, which has a bearing on this problem. For many years, in this country chiefly, I have suffered at intervals from typical attacks of migraine, associated before the onset of pain, with slight dimness of vision, fortification spectra, and sometimes slight giddiness. Coincidentally there is some gastric tenderness, with slight nausea. These attacks are more frequent when I am much overworked, and sometimes continue for some days unless I take vigorous means to abate them. Some years ago, acting on Hare's advice, I went on a diet from which carbohydrates were largely excluded, with the result that I remained free. Naturally, as most dieted people do, I gradually fell away from grace, and they recurred. During the last year or two I have had attacks of gastralgia, which frequently come on in the night, and which are unassociated with any immediate indiscretion of diet. Now I get immediate relief from these attacks by taking a tablet of glonoin or inhaling nitrite of amyl, also by the application of the hot water-bag to the epigastrium. I am quite satisfied that this is a vaso-motor disturbance, which alternates at times with migraine. I may say that I am a spare eater, but, alas, unable to take much exercise. A holiday, with its escape from a sedentary life, has always a beneficial effect.

My experiences with epilepsy have not been so favourable as in the other neuroses, though such small measure of success as I have had has encouraged me to attempt this treatment in such few cases as have come my way.

When one considers what a poor outlook is before any such cases, one is disposed to try any method of treatment that promises any hope of improvement at all.

These best results have accrued in those patients in which elipepsy was associated with asthma. I have had a good many now in which these conditions alternated, and in nearly all of these both complaints have been abated or abolished.

Possibly the poorer results in those cases of pure epilepsy are due to the fact that the brain vessels are thin-walled, and, if one may so put it, more susceptible or responsive to alterations of blood-pressure. Further, to put it crudely, one might say an epilepsy habit had been formed.

The results have been better in the minor forms of epilepsy.

Of dysmenorrhœa my experience has been limited, but one case in particular is worth mentioning. The pain was both ovarian and uterine in character. After cauterisation of the septum and inferior turbinal, both were relieved. Some time later, whilst I was snaring the enlarged anterior end of the right inferior turbinal for obstruction, the patient cried out that it was bringing back her old pain, at the same time applying the hand to the right ovarian region.

This observation I find is confirmed by Fleiss, who has given the name of nasal dysmenorrhœa to this phenomenon. He believes that the true source is in the tubercle of the septum, and the anterior end of the inferior turbinal. My experience is that cauterisation of the anterior end of the inferior turbinal modifies the abdominal pain, and of the tubercle that in the back. I cannot explain this; but it may help to support the contentions of Monnier.

Koblauch, Schiff, and Moll have recorded observations on somewhat similar lines.

It seems hardly necessary to quote further cases, or detail other neuroses in which I have tried this treatment; but I would like here to call attention to a curious investigation that I made some years ago, and which I quoted in my paper of January, 1906, already mentioned.

During an attack of asthma, and preceding an epileptic seizure, there is a large increase in the eosinophiles in the blood. Between the attacks they fall to normal. Well, in a number of cases, with counts ranging from 9 to 35 per cent., I found that after complete relief of the asthma by intranasal interference the eosinophile count had returned to normal.

I am quite unable to give any explanation of this result, and this is one of the points upon which I hope light may be thrown by this discussion. At this time it is hardly necessary or desirable for me to discuss other neuroses in which attempts have been made to obtain relief by nasal methods.

That complete relief can be obtained in many neuroses I have sufficient proof, and that the results are not only temporary I also know.

Quite recently I met the first case ever treated by Francis, fourteen years ago, and he is still perfectly well. Needless to say, why he is well does not worry him; he is satisfied to be well. And in that lies one great argument why this treatment should be tried in every case. Of course there are failures—if we knew more there would be fewer; but no two cases are alike, and it is only by many observations, by many men, that the truth shall be attained. What, then, shall we do? Francis' first results were obtained by touching the region of the tubercle of the septum, where frequently a pale, boggy swelling may be found, and naturally one's attentions tend to centre round that area; but I have found that is not the only area that affects these conditions. The anterior end of the inferior turbinal, the anterior edge of the middle turbinal, mainly for cough, the posterior end of the septum occasionally, where a small, pale swelling is found, and in the middle meatus, seem all to respond to treatment. I must say I have not attempted to work out areas as elaborately as Monnier has done. I remove any shelves or spurs that may seem to offer a point of contact with the turbinals, and I have resected many septa where it was difficult to abate contact between the septum and turbinals. In several cases of asthma, that has been sufficient to afford complete relief. I resected a man recently who has been a confirmed invalid for many years, and he has been perfectly well ever since, and is rapidly piling on weight.

I find polypus cases do not do too well. If any purulent sinuses exist they are dealt with, and the nose got into as healthy a condition as possible; but yet many are failures. My experience agrees generally with that of Francis. The more normal-looking the nose the more likely the recovery. If no benefit seems to accrue from nasal treatment, I then fall back upon restriction of diet and drugs.

Naturally one seeks to amend any departure from a rational way of living also. In asthma considerable help may be got by causing the patient to sleep out of doors. Whether combustion is better or the cooler air constricts the dilated bronchial vessels, I know not. Consumption of alcohol as a beverage must be restricted or abolished. Of drugs I find iodide of potash, the nitrites, and grindelia the best. Arsenic, combined with iodide of soda and alkalies, is most useful for a long course of treatment. Adrenalin has been lauded, and I have found it give complete relief from a severe paroxysm in three minutes if given in 5 minim dose hypodermically; but it is stated to produce atheroma very quickly, and I have generally avoided its use.

I need hardly go further into treatment. When one's life is cast in the outer regions, far removed from the stimulating atmosphere of a medical school, one is apt to become rusty in one's physiology, and in those lines of thought and research which are not immediately concerned in prosecuting the daily round; and I warmly welcome this opportunity of hearing your views on this question. I offer you no polemical or learned discourse, but a plain, unvarnished tale (I hope unbiassed) of what I have myself experienced. The explanation I offer of these phenomena may be correct or no, but I would ask you, of your wisdom, to give me yours. I can vouch the facts.

DISCUSSION.

Dr. A. J. BRADY referred to the great difference of opinion held by different observers as to the value of intranasal treatment in asthma. He could not understand anyone who had given it a proper trial doubting its value in a large proportion of cases. He was not one of those who speak of "cure" in a disease like asthma, but he had personal knowledge of cases that remained free of symptoms for several years after intranasal treatment—cases that till treated had been in considerable suffering. He could not quite understand how the treatment had come to be called Francis' treatment. Like most other rhinologists, he had personally used intranasal treatment in asthma for over twenty years. Referring to cases that do well after treatment, although they show no intranasal abnormality, he said that personally he could, in cases of nasal reflex neurosis always find a swollen, irritable area on the anterior region of the septum, high up, particularly if the tissues were previously contracted with adrenaline and cocaine solution. He cauterised this region, making from two to three vertical scores through the swollen ridge. He thought it necessary, without being too drastic, to divide some of the irritable nerve fibres. He thought the immediate after-application of glycerine acid carbol useful; it may help the action of the cautery in subduing the reflex. Where there is marked inferior turbinal hypertrophy, it is much better than cauterisation to make a submucous resection of the anterior end of the swollen turbinal. A wedge-shaped piece of bone and soft tissues is cut away at the outer attachment of the bone, the remaining portion of the turbinal is pressed out into the gap, and a packing

of bismuth gauze applied to hold the flap in position and prevent bleeding. Dr. Von Vardeleten's Bismuth Brandinde, designed for a dressing for burns, is one of the best intranasal dressings possible. It does not cling to the tissues, so comes out without pain or bleeding; it remains aseptic. Some other forms of bismuth gauze put on the market are useless, as they contain too little bismuth; consequently they cling to the tissues, and start bleeding when withdrawn.

Dr. JOHN MURPHY (Melbourne) stated that he considered asthma to be due to instability of nerve centres; that impulses were carried to those centres by afferent nerves from various parts of the body, such as the nose; the result of such impulse was a reflex bronchial spasmodic condition—asthma. He did not consider the nose the only point at which afferent impulses might start. He thought the nerve centres were often made unstable by toxæmic conditions in the blood, as in uræmia. To determine if the nose were at fault, he advised probing and exploring for sensitive areas, which, when irritated, brought on an asthmatic attack; in these nasal cases cocaine should be applied to the sensitive part during the attack, and if relief were obtained he took this to be a guide for cauterisation and destruction of the sensitive areas, and so relieving the condition.

Drs. Stewart (Dalby, Q.), Gibson (Brisbane), Pulleine (Adelaide), Weiben (Sydney), Barrett (Melbourne), Kent-Hughes (Melbourne), Kirkland (Sydney), Ewing (Melbourne), and Nihill (Melbourne) also contributed to the discussion.

DISCUSSION ON DISEASES OF THE NASAL ACCESSORY SINUSES.

Opened by Dr. A. L. KENNY, of Melbourne.

DIAGNOSIS of diseases of the accessory sinuses of the nose has become much easier in recent years; but there are still great difficulties in detecting how many of these sinuses are affected in a given case. There are careful, well-informed, and experienced practitioners who maintain that the disease of a single sinus is a rarity. The most recent books are modelled in the direction of regarding the various sinuses as one whole as to pathology and diagnosis. Probably the easiest to diagnose are diseases of the antrum of Highmore, though such are rarely existent alone, save in those cases of dental origin. It is not always easy in cases of purulent disease of the frontal sinus and the antrum of one side to ascertain whether the antrum is merely a receptacle for pus flowing from the frontal sinus or whether it has a purulent affection of its own. The frequent inequality in size of the frontal sinuses tends to make difficult the diagnosis of disease therein. Again, there may be very considerable trouble in discriminating between disease of the anterior and posterior cells of the ethmoid.

In the diagnosis of nasal accessory sinus disease, careful examination by inspection of each nostril and of the nasopharynx is necessary. If pus be present its site should be noted, and it should then be removed and the effect of posture on its return carefully watched. Transillumination by single lamp gives very valuable evidence in conjunction with these methods of examination. X-rays are also of great assistance, but the direction for the photograph and the interpretation of the results obtained on the plate require very careful inspection and determination. Patient should lie face downwards on a table, the photographic plate (8 in. x 10 in.) should be under the face and should make at the edge nearest the chin an angle of 25 degrees with the table, and the X-ray tube should be placed opposite a point at back of the head midway between the occiput and the vertex, so that an imaginary line dropped from it through the frontal sinuses would be perpendicular to the table. Plates should be used for diagnosis, not prints. Puncture of the antrum of Highmore through the nasal wall is practised diagnostically as well as therapeutically. Dentigerous cysts sometimes complicate antral disease and occasion trouble in diagnosis, though easy of diagnosis *per se*.

Diagnosis.

1. Questioning:—Nature of discharge—consistency, colour; unilateral or bilateral; continuous or intermittent; affected by posture; offensive (1) to patient, (2) to others; pain or headache—site.

2. Rhinoscopy—*ante* and *post*—Pharyngoscope (Hay); probes—polypi, granulations, atrophy of mucous membrane, crusts, ulcerations, necrosis, adenoid growths, septal irregularities, turbinal hypertrophies.

3. Transillumination; X-rays.

Treatment.

Removal of cause (dental, septal, turbinal); evacuation of pus; removal of growths; irrigation useless if decayed tooth; drainage useless if polypoid mucous membrane, or carious bony walls; curetting antrum receptacle of pus from frontal sinus not good; (?) curette all away or not (on this there are divergent views).

Frontal.—Irrigate, remove anterior inferior turbinal; if pain or evidence of imperfect drainage, do radical antrum operation.

Ethmoid.—Care in curetting laterally and at top.

Transillumination with a double lamp is useful in frontal sinus cases, giving a simultaneous illumination for both.

X-ray plate should also be obtained laterally. This, with antero-posterior plate, gives a notion of the extent of the sinus in each dimension, and helps to determine the choice and extent of operation.

Pus in middle meatus = frontal, ante-ethmoid, or antrum. Pus between septum and middle turbinal indicates ethmoidal or sphenoidal cells, which drain into superior meatus.

Conservative treatment may be successful in very many cases. The use of Dobell's or similar lotions, after the manner of Greville MacDonald—the lotion used as hot and as frequently as possible—will often promote free drainage of inflamed nasal accessory sinuses. Cocain with adrenalin and menthol—hot inhalations—inhalations

of Ol menth pip—all these may be used in combination, if necessary, and will often cure, and will certainly relieve. Conflicting accounts of vaccine therapy come to hand from various sources. Some specialists are most enthusiastic as to its value. Radical operations, if operations at all be necessary, are preferable. Puncture of the nasal wall of the antrum of Highmore may, on account of anatomical peculiarities, be difficult or well-nigh impossible, and where septa exist it will fail to give cure; free opening by the canine fossa allows of complete removal of all diseased structures, and close inspection of walls and contents. Those who practice complete curettement of the mucus membrane lining the antrum must be careful at the roof, where the infraorbital nerve is usually without bony protection. Killian's severe radical procedures for frontal sinus disease have been judiciously modified of late years, with distinctly good results. Much caution should be exercised in the breaking-down and curettement of ethmoid cells to avoid meningeal complications. Quite a number of methods for opening and draining frontal sinuses from the nose have been introduced and practised since 1900. They are full of risk, and can only be preferred to external operations in a limited number of cases.

It is my own practice to strip any accessory sinus I operate upon completely, to remove the whole of the lining membrane, leaving bare bone.

In conservative treatment attempt is made to facilitate drainage by cauterisation of, or partial removal of, all hypertrophies of turbinals or other structures, of polypi and other tumours.

Tumours of the accessory sinuses are infrequent, and are usually either polypi or sarcomata. In these latter, where complete removal may be very difficult or impossible, partial removal has been found to give many months of relief, and in some few cases such operations two or three times repeated have led to cure. Pituitary extract has given and retained a remarkably bloodless field for operation in such cases.

Deflected nasal septa.—J. J. Wilson, *Medical Record*, 29th January, 1910.

As in man the brain-case develops at expense of bones of face, the effect shows as follows:—

1. Recession of jaws.
2. Gradual disappearance of accessory sinuses.
3. Deflected septa.

In vertebrates, in which sense of smell is highly developed, accessory sinuses are large, and afford room for ramifications of the turbinal scrolls, and consequently indirectly contribute to the space for the distribution of the olfactory nerve filaments.

Problematic if access, sinuses subserve any specific purpose in man. Suggested:—

1. Give more resonance to voice—probably accidental and not natural selections.
2. To increase space for bone surface available for muscle attachments of face—does not stand test of close reasoning.

In human embryo there is a complicity of accessory sinuses and nasal fossa which subsequently disappear. In primitive man there was a greater development than in modern. Schaffhausen remarked on extraordinary development of accessory sinuses presented in Neanderthal skull. He considered this a typical race characteristic, not individual or pathological deformity.

North American Indians and Eskimos have unusually developed accessory sinuses. Close measurements in museums of natural history in New York City are in favour of opinion that sphenoidal cells are undergoing developmental changes common to those organs which no longer subserve any specific useful purpose to the organism.

As access nasal cavities deviate more and more from primitive type their liability to disease correspondingly increases. Chronic and acute sinusitis very prevalent in modern civilised races; frequency of occurrence in no way dependent on any particular kind of climate or geographical locality.

Chronic suppurative sinusitis often exists, without much apparent trouble to persons. Martin tabulates 746 autopsies in which accessory sinuses were examined—249 gave evidence of chronic sinusitis. Wright concludes that accessory nasal sinuses do not at present subserve any useful purpose, but are to be classed among the disappearing vestigial organs, which fact largely accounts for their liability to disease.

James Adam, M.D., nasal surgeon, Glasgow Infirmary, in a note on Turbinal and Sinus Functions, contends that the accessory sinuses have a more, the turbinals a less, important share in the hygrothermic functions of the nose (warming and moistening of inspired air), and more especially during the forced respiration of exertion. Sinuses are chambers for storing reserves of warm, moist air to be instantly mingled with the inspiratory air, especially on exertion.

According to Bryson Delavan, after International Medical Congress, Buda Pesth, 1909, the symposium on sinus diseases gave evidence of a strong tendency toward a more careful and conservative consideration of radical methods. Its result will be to recall the attention of the profession to the possibilities of intranasal treatment.—Wood Andrews Head, pp. 281, 1910.

Dr. JOHN MURPHY (Melbourne) stated that he thought diagnosis was most important. In all patients complaining of nasal discharge he advises a thorough examination of the nose, especially under the middle turbinal body; if pus is seen, it should be wiped away. If the head is now held down for a few minutes, in sinus suppuration pus will be visible when the nose is re-examined—not so in suppurative rhinitis. Next, transillumination should be done; if dull over one or more sinuses, these should be explored.

The maxillary sinus.—By passing an exploring needle in under the inferior turbinal body, and syringing out the sinus with sterile normal saline solution, pus is seen coming away with the lotion; after syringing lotion, syringe air through the sinus, and leave it as dry as possible. If now we inspect the region under the middle turbinal some time after washing out the maxillary sinus and find no pus

present, we many conclude that the maxillary sinus is at fault; but if pus is present under the middle turbinal, it is coming from the frontal sinus, or anterior ethmoidal cells. If the anterior end of the middle turbinal is removed and the frontal sinus washed out, pus is seen. If now pus is still seen under the middle turbinal, it is coming from the anterior ethmoidal cells. Pus seen above the middle turbinal is coming from the posterior ethmoidal cells, or the sphenoidal sinus.

In catheterising the frontal sinus it may be very difficult, for many reasons—

- (1) The bulla ethmoidalis may be high up and bulge into the infundibulum, and render the passage of the cannula difficult or impossible.
- (2) An anterior ethmoidal cell may open into the infundibulum, and the catheter may enter this and not the frontal sinus—the distance the catheter goes up will make us suspect this.
- (3) There may be a large middle turbinal body present which may contain cells which contain pus; this enlarged turbinal will require removal before the sinus can be explored.

The size of the frontal sinus varies considerably.

The differential diagnoses of empyema of the antrum of Highmore and a dentigerous cyst was important. A cyst bulges anteriorly; a suppurating sinus does not. If a sinus bulges, it does so into the nose. As a rule, on exploring a cyst, it contains clear fluid.

With regard to treatment, he had seen the electric light bath used at Professor Killian's clinic, at Freiburg, in cases of acute sinusitis.

In chronic suppurating sinusitis he advised operation—Caldwell Luc operation in empyema of the antrum; where this did not succeed he did the Denker operation.

With regard to the removal of the mucous membrane, he removed it in chronic sinusitis.

R. H. Woods, president of the Royal College of Surgeons in Ireland, removed it in all chronic cases he had seen him operate on. Last year Herbert Tilley, at University College hospital, showed me at his operations that he generally did not remove the mucous membrane. When in Vienna, he (Dr. Murphy) saw Hajek do several cases, and in every case he removed the mucous membrane. At Killian's clinic he also saw the mucous membrane removed.

With regard to operation in frontal chronic sinusitis, he thought the operation to be done depended on the size and condition of the sinus. Where the sinus was small and shallow, mere removal of the anterior wall gave relief, but where it was large and deep, extending well over the orbit, there was no alternative but to do the Killian operation.

Dr. E. R. SAWREY said:—In antral cases, where the disease is of dental origin, alveolar puncture and syringing, carried out for some time, will frequently, perhaps generally, effect a cure. Where the disease is of nasal origin, and is not of too long duration, puncture

and syringing through the inferior meatus of the nose, repeated at intervals for some time, should first be given a trial, and will sometimes succeed. Should more radical measures be deemed necessary, I have had the most gratifying results from removal of a small portion of the anterior end of the inferior turbinate, and, by means of a large burr, breaking away the whole of the inner wall of the antrum, until an opening the size of a shilling is obtained. Certain specially designed instruments help very much in some cases in enlarging this opening. Care should be taken to remove loose pieces of bone, and to leave no bridge, or as little as possible, between the antral and nasal floor. The operation is not severe, and the patient soon recovers from the effects of the general anæsthetic, which is advisable, as the operation is painful. Hæmorrhage is controlled by plugging the nostril with cocaine and adrenalin prior to the operation. This procedure has given me most gratifying results, and a large proportion of cases are cured by it. Should it not succeed, the more radical operation through the canine fossa can be performed. I do not consider it advisable to curette away the whole of the antral mucous membrane; it makes the cure so very much longer.

In ethmoidal disease, I have obtained the most satisfactory results from thoroughly curetting out the whole region by tractis method, and so far no untoward result has followed. I have been so satisfied with this treatment that I have not felt justified in any case in proceeding to external operations. The nose must never be packed after the operation—in fact, after any operation of that nature—if it can possibly be avoided.

As regards frontal sinus disease, the more I see of these cases, and the more I read the literature on the subject, I become increasingly convinced that intranasal methods of treatment, removal of the middle turbinate or the anterior portion of it, and curettage of the infundebular region and opening up and removal of ethmoidal cells in this area, should always be persevered with for a long time, and that it should be a matter for the gravest consideration before recommending any patient to undergo a severe external operation, with the idea of a radical cure. Fatal results seem to be fairly common, and one at present has no means of knowing in what cases they are likely to occur. The more I see of frontal sinus cases, the more conservative in treatment I become.

Discussed also by Drs. Kent Hughes (Melbourne), Gibson (Brisbane), Pulleine (Adelaide), Robertson (Brisbane), Percy Webster (Melbourne), and Harty.

ON THE SUBMUCOUS RESECTION OF THE SEPTUM NASI.

By R. H. PULLEINE, M.B. (Syd.), Adelaide.

THE perfected submucous resection practised to-day has, like all other important operations, had a long period of evolution. As far back as 1882, A. Hartmann practised partial resection of the septum. In 1883, F. Peterson wrote on subperichondrial resection of the cartilage. Krieg in 1886, and Boenninghaus in 1899, as well as Hajek and Cholewa between these periods, further elaborated it, and nearer our own time Killian and Zarniko in Germany, and Freer and Ballinger in America, have brought it to its present state of technique.

We may regard the septal partition as being composed of the quadrangular cartilage with the vomer and perpendicular plate of the ethmoid. At the junction of the two bones the cartilage intrudes its sphenoidal process, which, at its posterior end, may be ossified, forming a sharp pyramidal body, often called the spina septi. This may protrude on either side, more frequently on the left, and may be in close contact with, or even imbedded in, the inferior turbinate body. At its base the quadrangular cartilage rests on the nasal crest of the superior maxillary bone, and in front of this on the incisor crest of the same bone. This part of the cartilage may be much thickened, and is sometimes called the vomero-nasal cartilage.

Besides these, the incisor crest itself forms an important part of the septum, and its expansion may be an important factor in anterior nasal obstruction. This is true, but less often of the nasal crest, which may be laterally deviated.

The indications for submucous operation are several—

- (1) It may be required in a general deviation of the septum.
- (2) To remove a troublesome nasal crest or spine boring into the turbinate, and causing reflex irritation.
- (3) To ventilate the roof of the nose, and as a preliminary to dealing with an incarcerated middle turbinate or a frontal sinusitis.

As regards the etiology of deviations of the septum there is no doubt that injuries play a frequent part, buckling it and driving its base down on one side.

I have seen this occur in as short a time as two months after an injury.

Developmental changes in the septum occurring after the fifteenth year often give rise to deviations, and in some families nearly every member is affected.

Deviations in quite young children are not common, and nearly always the result of injury.

The operation.

The instruments I find most useful are:—One small scalpel; two fixation forceps, one bent ear-forceps, one Heymann's cutting forceps, one Killian forceps, one bent chisel with mallet, Killian's nasal

speculum, two Freer's golf stick elevators, one smooth and one toothed on the edge.

These, with a mouth-mirror and eye-needles, with No. 00 catgut, used with Worth's needle-holder, are all that are required.

Anæsthesia.

Half an hour before the operation the nasal passages are packed with wool tampons, soaked in about 10 per cent. cocaine and adrenalin.

The patient is then placed on the table in the dark-room, with the light on the left side of the head. He is blindfolded with eye-pads to obviate discomfort from the light, and to prevent him seeing the instruments.

A piece of rubber tubing about a foot long is placed in the mouth to breathe through, and a small towel put over the lower part of the face.

The anterior edge of the cartilage is pressed into the left side of the nose, and ethyl chloride sprayed on the skin until a frozen spot appears. Into this spot is injected a few drops of $\frac{1}{2}$ per cent. cocaine, with a trace of adrenalin in the solution. The tube and towel are now removed. This method obviates the exquisite pain of pricking the sensitive skin of the introitus nasi.

Further injections of the anæsthetic solution are now made at short intervals along the base of the septum on the roomy side, and into any bony spur or ridge awaiting removal. An incision is now made through the skin along the whole length of the anterior edge of the cartilage pressed to the left side. As soon as the cartilage is exposed it is seized with one fixation forceps, and the skin to the right of it with another pair. The right side of the cartilage is now denuded until the perichondrium comes into view, when it is vertically scratched, and the perichondrium lifted with the smooth Freer's elevator.

If one is in the right plane the elevator passes back without any force, and its movements can be controlled by the speculum in the right nostril.

If one is not in the plane it is at once obvious on inspection, as the end of the elevator can be seen through the transparent mucosa, and a fresh search for the right plane must be made. The muco-perichondrium, and further back the muco-periosteum, having been elevated over a sufficient area, the toothed elevator is brought into use to separate the more resistant tissues at the base which do not yield to the smooth elevator. This instrument is used like a small saw, and by keeping close to the bone separation is easy. My instrument was made in Melbourne by Meyer and Meltzer.

The fixation forceps is now transferred to the skin edge on the left side, and a like separation made over as wide an area as possible, or as required. At times one has to be content with a very anterior separation on the occluded side, to be completed when one, so to speak, gets round the corner of the obstruction. Both sides having been freed, and the skin wound extended upwards and downwards to its fullest limits without encroaching on the mucosa below, the

cartilage is received between the blades of the Killian's speculum, the handles being held upwards, and care being taken that the blades are under the perichondrium.

About a centimetre behind the anterior edge of the cartilage a vertical incision is made through its substance, and extended upwards and downwards with the plain elevator.

This makes a vertical slit in the cartilage, and this new edge is received between the blades of the speculum. The anterior uncut portion of the cartilage is not seen any more during the operation.

With the sharp Heymann's forceps the visible edge of the cartilage is rapidly cut away between the blades of the speculum as far upwards and downwards as necessary or possible.

Some cartilage will remain at the base, and this is gouged up *en masse* by the bent chisel, and removed with the Killian's forceps. The cartilage having been removed, attention is given to the vomer and ethmoid. A good Heymann's forceps will bite this away as well as the cartilage, but larger fragments may be broken off with the flat Killian's forceps, care being taken that the sharp pieces do not lacerate the soft tissues during removal.

A large lateral pyramidal spur at the extreme posterior limit may present a problem.

Being jammed against the turbinate, and having steep sides, it cannot be grasped. The only way is to cut away the bone above and below it, when it can generally be pressed in and removed entire.

We now have the bony base to deal with. This is left until last, especially the most anterior part, owing to the liability of hæmorrhage from the naso-palatine artery or other smaller vessels.

I have found none of the bone forceps in vogue of use in this part of the operation. The bent chisel here finds its place. The sharp edge is applied to the bone, and when a purchase is obtained a few taps of the mallet drive it well in. The handle of the chisel is now depressed, and if sufficiently loosened the ridge is elevated, and can be removed whole or in pieces with Killian's forceps. The last part to be chiselled off, if necessary, is the incisor ridge, and here there is sure to be some bleeding, but as the operation is concluded it does not matter much. Both sides being inspected to see that a perfect result has been obtained, the patient is turned on his side, and the space between the flaps syringed out with weak peroxide of hydrogen by means of a cannula and Higginson's syringe.

The skin wound is now closed with three or four No. 00 catgut sutures, and a compressed wool plug introduced on each side, and made to expand with saline solution.

After a short rest the patient is allowed to go home.

In twenty-four hours the plugs are removed, and the passages sprayed with liquid paraffin. This is repeated on two or three successive days. When the after-treatment is concluded, very occasionally it may be necessary to reintroduce a plug on the narrow side once or twice. The skin wound is healed in twenty-four hours.

Control of Hæmorrhage.

In the majority of cases the hæmorrhage is not troublesome if the parts at the base are not interfered with too early.

Short woollen rolls at first, with long ones later, are used to absorb the blood, and this keeps the assisting nurse busy.

The woollen rolls are made in batches of some hundreds at a time, and sterilised in large test-tubes. In one operation few of these tampons may be used, in others hundreds.

In all cases there is some oozing after operation, and sometimes a little hæmorrhage after the effects of the adrenalin have gone off.

I have only met with three bad cases of hæmorrhage during operation, in one of which I had to postpone the completion of the operation for twenty-four hours; in a second it occurred just at the completion; while in the third I had elevated the nasal ridge, and was met with such a rush of blood that I had to draw a stypticine plug right through the left passage. On removing the plug in forty-eight hours there was no further hæmorrhage, and I found his ridge had been so elevated that it no longer formed an obstruction.

Complications in operation—

Perforation.

Perforations occasionally occur, but rarely so if the right plane is worked in. In my early cases when I failed to observe this I had several, and it is not uncommon to get a small laceration on each side; but if they do not coincide no perforation occurs.

Perforations are more likely to occur in cases where some other operation has already been done, and the perichondrium will not strip properly where Ash's operation has been done or the septum cauterised; also where there has been an injury with hæmatoma of the septum. In the latter case stripping is almost impossible.

In the operation for the last year I have only seen one small perforation far back due to laceration in removing the sphenoidal process or spur.

Complication during after Treatment.

Hæmatoma.—The object of packing tightly on each side is to prevent a hæmatoma between the flaps. Occasionally, however, such may occur on the day of removal, but absorbs in a few days, leaving no trace. It is not advisable to reopen the wound and wash the clot out, as bleeding only occurs again.

Abscess.—I have seen one case of septal abscess following a post-operative hæmatoma. There was no trouble after simple evacuation by pricking the bulging septum.

Sepsis.—I have seen two cases of slight sepsis, caused, I think, by influenza in the patients. The wound reopened and sanious fluid escaped; for a few days there was slight pain and headache, but both entirely recovered within a fortnight. I have only operated on two cases in private hospitals, at their own request.

All other cases were allowed to go home at once, and many returned to their work on the second day.

Remarks.

I can strongly recommend the skin incision, as it is easy to make; it is well to the front, and there is no tearing back of the mucosa as the operation proceeds. One is able to open the speculum to its fullest extent, and the healing of the wound is immediate and faultless.

There is seldom any difficulty in making the edge of the cartilage present on the left side, and one can in case of need operate from the right. In the rare cases of extensively crumpled septa, where one finds a hopeless mixture of connective tissue and cartilage the only way is to make an opening, and by careful manœuvring convert a defeat into a victory. I have never seen any cases of depression of the bridge follow the operation as sketched out, as it is never necessary to remove the cartilage extensively under the soft parts, and in operating to ventilate the roof one can go up under the nasal bones quite freely without fear.

Pain.—With the method of anæsthesia used pain is almost absent. Of late I have rarely had to interrupt the operation on account of pain, and then it has only been necessary to repack the roof of the nose with anæsthetic tampons for a few minutes. I have operated on the most absolutely nervous people, and cannot conceive that the operation could be performed under general anæsthesia.

My last remark is that if a very extensive basal bony process is present, deflected to one side or bulging prominently into both sides, do not interfere with it; a large communication between the nasal and palatine artery is sure to be lurking there.

Dr. Pulleine's paper was discussed by Drs. Marks, Gibson, Sawrey and Arthur.

RETROSPECT OF A SPECIALIST'S LIFE.

By CHARLES L. M. IREDELL, M.B.

THERE is a pride of age, as well as a pride of youth, and, fearing lest my exhibition may precede a fall, I would ask of you to deal gently with me, and believe that I bring this paper before you thinking only that what I have to say may be of some trifling interest.

Speaking, as I must do, of myself, I will ask you to excuse the egoism as absolutely unavoidable. I would ask you also to remember that I am not proposing to give an historical review of this branch of surgery. This has been dealt with by various authors. I wish to confine myself merely to those things which have passed under my own individual notice.

I believe I am strictly correct in stating that I have been practising our special department of surgery longer than any living Anglo-Saxon. I do not claim thereby that I know more than any other body; on the contrary, I am mindful of a snub I once received from a lady patient to whom I had, apropos of something, said, "Every one is either a fool or a doctor at the age of 40," when she quietly replied, "I suppose it is possible to be both." Still I hold that in no calling more than that of a medical man, and if anything more so in a specialist, is experience of greater value.

In the year 1874 I joined Mr. Dalby (afterwards Sir William) as his assistant. He had recently been appointed Aural Surgeon to St. George's Hospital, and had just completed the purchase of Mr. Hinton's practice at 18, Savile Row. At that time, with the exception of the appointment at Guy's Hospital held by Mr. Hinton, not one of the then eleven medical schools in London had any special department for ear, nose, or throat work. Mr. Hinton had succeeded Toynbee at 18, Savile Row, and in the room which was given to me in this house I occupied the very chair in which Toynbee died. You may not all of you know that Mr. Toynbee was found dead in this chair with a silver Eustachian catheter in this right nostril, and a bottle of chloroform on the table beside him. The uncharitable, of course, declared that he had committed suicide; as a matter of fact, it was obvious that he had been experimenting on himself in the research which marked him as undoubtedly the greatest original worker and father of English aural surgery. He left to the Royal College of Surgeons, London, a most valuable and interesting collection of anatomical and other specimens, which may be seen in their museum.

I might here mention a curious illustration of the extremely conservative character of the old world. The year before I came out to Australia (1885) I was taking charge of Mr. Dalby's practice, he being away shooting in Scotland. A very fine old gentleman of over 80 called: I made the usual regrets that Mr. Dalby should be away, &c., when he cut me short by saying, "My dear sir, you need make no excuses. I don't know Mr. Dalby; I never heard of Mr. Dalby but I came to this house fifty years ago as a patient of Mr. Toynbee's, and I thought it might still be an aurist's house."

At this time, the only men practising this specialty in London other than Mr. Dalby, were Mr. Harvey, of Golden Square, and Dr. Morell Mackenzie, who had just started his Throat Hospital, also in Golden Square. Hinton had retired in favour of Dalby, and his place at Guy's was not filled up for some months, when Mr. Laidlaw Purvis was appointed.

Shortly after this, appointments were made at King's College and St. Mary's, but it was some years before Mr. Cumberbatch was placed at St. Bartholomew's, and then the other hospitals fell in line pretty rapidly. But during all this time there is no doubt whatever that the specialists were looked upon in anything but a favourable light by the profession at large, and especially so by the heads.

I could cite many instances of this antagonism which came under my notice, but one will suffice. A young Frenchman at 21, the son of wealthy parents residing in Bordeaux, had come over to England to acquire the language, but suffering from ear trouble had become a patient of Dalby. The history of the case was one with which we are all painfully familiar—an old perforation dating from childhood and neglected. The external meatus was filled with a large polypus, which was removed by Dalby. A granulated tympanic cavity afterwards was treated with gallic acid. He had complained of violent headaches, but these had greatly subsided after the polypus had been removed, and at this juncture Mr. Dalby, being due at an important engagement in Scotland on 12th August, and the case being considered as doing well, I was left in charge. Almost directly the severe pains returned, and the friends, very naturally thinking that my experience was not all sufficient, called in other medical advice.

Nevertheless, in a few days he died. A post-mortem was ordered, at which I was present, and a large abscess of the cerebellum found. Well, it is probable that some of the men are now living, so I will give no further details, but merely remark that there was strong medical testimony available to show that the death had occurred as a result of the operation and subsequent treatment. Action was impending, but wiser councils prevailed, and the affair passed away. But I felt then very acutely what the position of the specialist was. To-day no doubt there would still be a criticism on such a case, but it would take the different form of asking why some further operation had not been performed. In that day, such a thing as exploring the lobes of the brain was a proceeding unwarranted by custom; indeed, the opening of the mastoid cells by anything but a small drill was considered heroic, and even that operation was regarded as of grave danger.

Also, at that time the insurance offices had not in the least grasped the danger to life of ear disease. To-day, in my opinion, they rather over-rate it. I have had some difficulty in getting cases passed who have suffered from discharge of the ears—the result of eczema.

The opposition of the medical world to specialism died very slowly. If anyone is now at all interested in this subject he should look up the *Fortnightly Review* for June, July, and August of 1885, wherein he will find the bitter controversy between Dr. Morell Mackenzie and Dr. H. B. Donkin, on this subject.

In his remarks (June, 1885), Morell Mackenzie says:—

“Anyone who should take the trouble to glance through the medical journals of twenty-five years ago, and compare the tone of their remarks on this subject with that of those of the present day, could not fail to be struck by the contrast. The very name of “Specialist” was a bar sinister excluding a man from the more coveted hospital appointments and from admission to some of the principal professional societies. The medical press lost no chance of abusing him, his brethren sneered at him in public and slandered him in private. Is it wonderful, then, that even moderate men, brought up in the traditions of old-fashioned medical practice, should have looked askance at specialism as something not quite orthodox, or at least of questionable respectability.”

He further mentions that “the first International Congress” fully recognising “Specialities” in sections was held at Copenhagen in 1884.

I am particularly anxious to avoid any criticism on treatment, old or new, but I may be permitted to say that trouble in the Eustachian tube is accountable for the great bulk of aural disease, and has necessarily received much attention in the way of treatment. Dr. Jas. Yearsley, M.R.C.S., who apparently had an “Ear Infirmary” in Sackville-street, London, W., wrote a small book on this subject in 1842, which I still possess. In it he advocates the use of the Eustachian catheter—at that time quite new, but I am unable to trace who originated it. I may mention here that Dr. Yearsley was, somewhere about the year 1859, in great trouble, having had two patients die in his surgery after using a Eustachian bougie—the subsequent inflation causing rapid and fatal emphysema of the tissues in the pharynx. The use of Eustachian bougies has, I believe, been almost entirely given up now.

Until just before I joined Mr. Dalby, the only means employed to pass air through the Eustachian tube, other than by catheter, was by using what was called Valsalva's method. It is curious that this device of the celebrated Italian surgeon was used by him in the seventeenth century, and that it remained for Professor Politzer to perfect it more than 200 years later. But at any rate, Politzer's method was a trump card in the hands of the aurist in my early days, and I remember meeting an aurist very down in the mouth who said to me—"Our business is done. Every blessed (I do not think that was the exact epithet) G.P. is using a Politzer's bag." Well, gentlemen, they do not all use, or even possess, a Politzer's bag to-day.

The use of the frontal mirror was certainly not quite new in my time, but it was not sufficiently appreciated, and indeed, those teaching students to-day will do well to insist, as I did myself at St. George's, that you have no right to *touch* anything you cannot *see*. Of course, the direct illumination by frontal lamp may be preferred by some, and in any case performs the same function. I have *seen* the search for a foreign body in the auditory meatus, less than thirty years ago, carried out in hospital. The patient under chloroform, and the instrument table bearing an inconceivable collection of various forceps—even including tooth forceps. With the assistance of this armamentarium, the surgeon was successful in completely disorganising the middle ear—no foreign body was extracted. We owe the introduction of the mirror to Professor Auton Von Trolsch, who read a paper on the subject in 1855. Although Dr. Hoffman, of Westphalia, had previously, in 1841, used an ordinary shaving mirror for the examination of the ear.

Cocaine, which has been of such great service to us either by itself or in combination, was unknown during the first year or two of my ear and throat work. I cannot remember the exact year, but I well remember procuring some, for a very particular case Dalby had in hand, from Bullock & Co. (Hanover Square), who were the only chemists in the West end of London who had it, and getting 2 grains of this as a favour at the price of 30s. a grain. It was used for the removal of an aural polypus, and acted very well. The price soon came down to something reasonable.

The knowledge and treatment of post-nasal growths was the one great stride of progress marking the history of aural surgery that has occurred in my time. Voltolini, Lowenburg, and Moore all claimed to have known and operated on these growths as far back as 1862; but it was not until the production of Meyer's paper, published in Copenhagen in 1868, that the profession awoke to the fact that something was discovered which it seemed almost impossible to have been overlooked, and then the awakening was slow, as will be seen from what I am about to tell you.

Exactly what other practitioners knew and did it is, of course, impossible for me to say, but Sir W. Dalby had by far the largest aural practice in London, and yet, until 1884, the treatment of post-nasal growths was practically little thought of. In that year an influential Russian family, who resided at Eastbourne, on the South Coast of England, had been patients of Mr. Dalby. One of the family—a Harrow school boy of 15—had been travelling from St. Petersburg through Europe with his mother, and she had been persuaded to consult Professor Moose, at Heidelberg. This interview resulted in an arrangement by which Professor Moose was to come over to Eastbourne and operate on the boy (and I may incidentally

observe that the fee he received was 500 guineas). Mr. Dalby received an invitation to be present at the operation, but as he could not go, I was deputed to take his place. I shall always remember it as one of the most serio-comic scenes I ever witnessed—but that, as Rudyard Kipling would say, is another story. However, I may mention that five other medical men were there by invitation. The boy was brought in, and sitting in an upright chair to which he was lashed arms and legs by the Professor, was then covered by a white sheet, and Moose himself had a sheet pinned round him. The first time, I may remark, that I had seen “white” worn in an operating room—black aprons being the custom in those days. A very elaborate gag was fastened by straps, fixing it to the head, and Professor Moose then curetted, rather violently it seemed to me, with a Lange’s knife—a modification of which I afterwards devised, and which is now known as “Dalby’s Curette.” You can all picture to yourselves what followed: blood streamed from both nostrils and mouth, a good deal blown and snorted over Professor Moose, and the greater part of both sheets were painted red.

The next few operations of this sort that I saw and assisted in were performed under an anæsthetic, but so great was the fear of the blood finding its way into the larynx that this was again abandoned for a time, and the favourite method was to remove these adenoid vegetations with the forefinger nail; in fact, I remember one specialist (not a London man) who was very proud of his finger nail and kept it in a case—Chinese fashion.

Although, in the days I speak of, nothing was done in the way of removal of post nasal growths, I cannot forget the very large measure of success in the treatment of deafness which followed the simple removal of enlarged tonsils. I have always thought that this must have been due to the local hæmorrhage depleting the adenoid vegetation, because enlarged tonsils, though often pendulous, never rise in the post-nasal space sufficiently to obstruct the orifice of the Eustachian tube. At any rate, the fact remains that tonsillotomy *did* restore the hearing in a vast number of young people.

In my slight allusion to the surgery of the mastoid, I should have noted the great advance that has taken place in the surgery of the ear generally. I remember a case which illustrates this very well. It was in quite the early days of my aural experience that I saw the case of an American magnate, who having desired to possess a bust of himself, had, as an apparently necessary preliminary, a plaster cast taken of his head. I understood that it was usual to protect the ears by placing wool in them, but somehow one of the ears was not thus protected, and in the process it became filled with plaster of Paris, and this set hard. The difficulties were certainly great, but I fancy the case would be dealt with quite differently to-day. In the attempts to remove the mass, the foreign body broke off short at the narrow middle portion of the meatus, and any pressure, even light touching with a probe, gave great pain. All sorts of consultation took place, and chemists were applied to if perchance they could find a solvent for the plaster of Paris. It *was* got away, but it was a long tedious business.

Altogether, looking back over a period of thirty-seven years, I feel that aural surgery has made magnificent advances. I fully believe that

the result of this work will be to immensely lessen the proportionate number of deaf people in the future, and undoubtedly save lives of many who would have died under the old conditions.

The one great disappointment to me during my connection with aural work is the little advance that has been made in the construction of instrumental assistance to hearing. The acoustical difficulties seem at present to be insurmountable, for the advertisement sheets of all the press in the world show what a demand there is for such aid, and this has undoubtedly stimulated untold numbers of ingenious and scientific workers.

My experience has taught me that practically not one deaf person in a thousand will use habitually any known contrivance. They will purchase them, try them, and put them on one side. I know of deaf people whose homes are stacked with these things—discarded. The apparently paradoxical thing about it is, that the better the instrument enables the patient to hear, the more trying does it become to the user. The objections which arise from the annoyance of always holding something, of the ear-piece causing local discomfort, and even the greater objection of attracting attention, might be suffered. But as the acoustical properties of the instruments magnify sound, so they also collect all sorts of overtones that become, after a while, simply intolerable. So that the few people I have known who really use such things find the old-fashioned conversation tube by far the most satisfactory, and this instrument has been in use for ages, and may be seen in Hogarth's pictures. For many years I had built up hopes that Edison, who is very deaf himself, would have brought out some cunningly-contrived megaphone that might meet the requirements; but I saw not very long ago in a paper that he had been interviewed on this very subject by someone, and had repudiated having ever made an attempt in this direction, and added that he was himself quite uninterested as he considered his deafness had been of the greatest possible advantage to him, for reasons he gave. Therefore it is evident one can look for no help from this quarter. However, this is not strictly within the function of the aural surgeon, who can, as I have said above, claim a noticeable and satisfactory advance in his art during the past thirty years. I cannot say the same for throat work—of course it did not lend itself in the same way to discovery; and since the introduction of the laryngoscope, which is ancient history now, nothing startling has arrived to assist, unless we could claim the introduction of diphtheritic antitoxin. It seems only yesterday, and indeed it is not many years, since we stood helpless beside the cot of the dying child. I have actually been "*cursed*" by a mother for doing nothing more to save her child. The horrors of those days must still abide with many who are not yet old.

Manipulative skill has, I really believe, advanced with the more perfectly constructed instruments, but though I have had the opportunity of watching many masters of the craft, I would give this tribute to the late Morell Mackenzie, that I never saw his like in this direction—his manual dexterity was truly marvellous.

That there is still a field of research which may spring a surprise upon us some day I can easily imagine. Something in this direction is in the air with regard to tonsils. A good deal has been written about this subject of late, and my friend, Dr. T. K. Hamilton, of Adelaide, has recently contributed a most exhaustive and valuable monogram on the 'naucial tonsils, which cannot fail to attract attention.

With regard to the nasal surgery, most certainly more has been done in this direction than was even thought of thirty years ago. Transillumination and the X-rays have enabled us to examine the autrum of Highmore and the frontal sinus, not only for foreign bodies, but for disease with precision; while with the surgery of the nasal cavities proper, the question would now seem to be, "How much of the contents of this cavity can be removed without making the last state worst than the first?" Polypi are dealt with much the same way as ever, but the snare has almost entirely superseded the forceps, and one does not see what I witnessed many years ago—an able-bodied surgeon pull a patient out of the chair by his nose, replace him, put his knee on his chest, and haul out a polypus with the whole or greater part of the middle turbinated bone attached.

Reflected light, cocaine, adrenalin, and better instruments have without doubt advanced all intra-nasal treatment, but nasal polypi return all the same—atrophic rhinitis still baffles our efforts.

Well, gentlemen, I feel that I have detained you long enough with my prattle, and will no longer put strain on your patience, but I should like to say that though I personally cannot, in the nature of things, expect to hold my own in the fore ranks very much longer, I may say that I took up my specialty with a sincere love for it at the first; and in the younger men pressing on I can see the promise not to be denied to their abilities and work, that they will ever strive to cope with the difficulties before them successfully.

Dr. ARTHUR (Sydney) hoped that Dr. Iredell would write a book dealing with the early history of laryngotomy, and the President expressed the pleasure that the members of the Section felt in listening to such interesting reminiscences.

DISCUSSION ON TUBERCULAR LARYNGITIS.

Opened by DR. KENT HUGHES, of Melbourne.

Some authors, according to Lake and Barwell, refer to a pre-tubercular stage consisting of anæmia, hyperæmia, or swelling, but without tubercular deposit. They do not mention it further, but point out that the term pre-tubercular is misleading—it is either tubercular or it is not. I gather that this reference is to an infiltration of the cord, the phthisical catarrh of M. Schmidt, which he proved by the use of tuberculin to be always tubercular.

Kyle (1907) writes: "The affection occurs co-existently with a similar process in the lung, and usually follows it, though rarely it may precede. The affection runs a more or less rapid course, and is usually of grave prognosis."

Sir Felix Semon in Allbutt and Rolleston's System (1908), shows that some recognise that tubercular laryngitis occurs not only more often but much earlier. "It is commonly supposed," he writes, "that the laryngeal complication of pulmonary tuberculosis usually occurs in the later stages. My experience, however, has shown me that laryngeal tuberculosis occurs in an unexpectedly large number of cases of early pulmonary phthisis. The occurrence of primary laryngeal tuberculosis is now

definitely established, but it is an event of the greatest rarity. What determines the occurrence of the laryngeal complication is not yet certain.

Tubercular laryngitis till quite recently was looked upon as a very late complication in pulmonary phthisis.

Tubercular Laryngitis.

The three chief points for discussion are (1) Incidence, (2) Frequency, and (3) Treatment.

Incidence: When and where.—Great contentions have taken place over the questions—(1) “Is the larynx ever affected before the lungs?” or (2) “As a primary focus.” Before death it is quite impossible to answer the first; and without a complete minute examination of the whole body it is manifest that we are unable to answer the second.

As regards the first question—it must be within the experience of all of us that undoubted laryngeal tuberculosis is present, when there are no detectable physical signs in the lung. A commoner experience is to find evidence of long-standing laryngeal disease with signs of incipient pulmonary disease. I know that older lesions may be present undetected and that physical evidence is absolutely no guide to the amount of pulmonary involvement, but still such a combination is suggestive that the laryngeal involvement was prior to the lung. Then, again, we have the post mortem investigation of Orth, Pojubinski, and Demme, who found undoubted laryngeal tuberculosis with quite healthy lungs.

I do not want to enter upon the vexed question of the route by which bacilli gain access to the lung, further than to state that both the bronchial gland route and the mucous membrane route have their counterpart in the larynx, viz., the cervical glands and the laryngeal mucosa. As far as the latter is concerned, it seems to me that the posterior aspect of the upper larynx is peculiarly well placed to catch any foreign substance left in the inspired air. For there is space here for a large amount of air to remain fairly undisturbed away from the mid-stream of the current.

Is there any reason why the larynx should not be infected prior to or apart from the lung? Gleitsmann says: “I do not see the rationale of the argument that demands the abstract absence of the disease in this instance of the lung, to be able to believe in the existence of another, viz., primary laryngeal tuberculosis. Trousseau, in 1837, maintained the principle of occasional primary localisation of tubercular process in the larynx, but admitted its general dependence upon preceding pulmonary involvement.

If we maintain that the laryngeal mucosa can only be infected by bacilli-laden sputum from the lung, then a good reason is put forward against primary laryngeal tuberculosis; but though it is possible, in fact probable, that infection may occur in this manner, it is absolutely certain that in very many cases where no sputum at all, much less bacilli-laden sputum, is present, undoubted and marked laryngeal tuberculosis is in evidence.

In sections of laryngeal tuberculosis as described by several investigators, the bacilli are found in the deep layers and not in the superficial layers of the mucosa, and they diminish in number as the surface is approached. This is strong evidence in favour of lymph infection as against surface infection.

When Watson and the older writers described tubercular laryngitis, they were dealing with the manifold ulcers of bronchi and trachea, which were evidently of surface origin, from the profuse bacilli-laden sputum in the late stages of a chronic pulmonary phthisis. This original view has been handed down and is hard to displace, but we must look for other modes of infection in more recent disease.

Many authorities favour the gland route for lung infection, and Demme found the bronchial glands affected in 80 per cent. of all cadavers examined by him; and Neumann found eight in 105 post-mortems on children supposed to be non-tuberculous.

In forty post-mortems, thirty of which during life had shown no sign of tubercle, Pizzini found latent disease of bronchial glands in 42 per cent. I give you these figures for what they are worth.

As regards infection of larynx from the cervical glands, many authors hold this view most strongly, and Lockard sums up the arguments thus:—

“Caries of the mastoid process and petrous bone are mostly referable to tuberculous disease of the middle ear through lymph channels—a bony focus originated through infection by way of the pharyngeal tonsil.”—*Ruge*.

“In an infection proceeding by way of the vascular system it is immaterial where the primary focus is situated.”—*Cornet*.

“Laryngeal tuberculosis may be caused by lymphatic transmission from a neighbouring focus, *i.e.*, in the palate, fauces, or tonsils.”—*Cornet*.

Lockard says, further, that it has been proved that a tuberculous process of the larynx itself becomes a source of further infection, either by contact or by lymphatic extension to neighbouring organs of mouth or pharynx.

Grünwald states: “There is no doubt that diseased cervical glands are capable of infecting the larynx. Many a so-called primary case is no doubt due to this cause.”

The cervical glands in their turn are infected from the tonsils and the naso-pharynx. It is estimated that at least 90 per cent. of glandular involvement arise in this manner.

Lockard gives two interesting histories bearing upon this point:—

- (1) “Girl, 11 years.—Hypertrophied tonsils and mass of adenoids, bilateral enlargement (marked) of cervical glands. Lungs normal and general condition good.

Three months after removal of tonsils and adenoids—the glands having quietened down—the left vocal cord was infiltrated and there was marked infiltration of the sulcus.

Pulmonary tuberculosis was never demonstrated. The tonsils were both infected with tubercle bacilli.”

- (2) “Girl, 7 years.—Large mass of suppurating cervical glands. Retro-pharyngeal abscess. Tonsils enlarged—deep crypts with tubercular concretions. The tonsils and glands were removed.

Three weeks later.—Rugous infiltration of sulcus, with ulcer in front of arytenoid cartilage.

Seven months later—post-mortem.—Lungs sound, larynx tubercular.”

A case in my own practice recently. Eight months ago, a lady, æt. 42, was brought to me—discharging ear and an ulcer on right side of septum occupying nearly whole of cartilaginous area, edges thickened. History of resistance to treatment—removed septum, pronounced non-malignant, later removed turb., &c., and ear discharge cleared up fourteen days ago. Cause of sore throat, &c.

We have, then, three routes by which the larynx may be infected, one in late and two in early tuberculosis.

The “per mucosa” route means a primary focus as far as contagion from outside the body is concerned. It does not seem such a very impossible condition, and the mucosa here must surely be exposed to a more concentrated dose of bacilli, and also is more subject to external influences as changes in temperature and in moisture in the inspired air; and to all those manifold conditions which help to produce catarrh. The mucosa on the posterior wall of the larynx also is constantly and continuously exposed to movements which sometimes are quite violent as in coughing and shouting, especially in the region of the arytenoids and accessory cartilages—regions which in my opinion are most prone to early infection. The “still” air in the post-arytenoid region and in the ventricles, may also afford additional opportunities for the bacilli to make a home for themselves. It seems to me that from the point of view of dosage that the termination of the bronchioles have the least chance of any portion of the mucous membrane of the respiratory tract from being overcome by tubercle bacilli. So one very important factor is in favour of the possibility of the larynx being primarily affected, and prior to the lung.

In the *American Journal of Medical Sciences*, June, 1902, in a very complete investigation, Lartigan and Nicholl concluded that primary tuberculosis of pharyngeal tonsil is probably more common than is generally supposed in the production of either localised or general infection.

Whatever view we may hold as to mode of infection, we cannot fail to be impressed with the enormous number of instances in which tubercular disease of the cervical glands has been found to be present and to be dependent upon diseased tonsils—faucial and pharyngeal. It therefore behoves us, as laryngologists, to keep these places clean. It has been urged that the tonsils may act as protection, and should therefore not be removed. This may be true of normal tissue, but when inflamed and hypertrophied, their pressure must surely be inimical.

In the same way also, we must strive to keep the cervical glands healthy, first by removing their primary focus of infection, and then, if that fails, to use tuberculin, or in bad cases excision and then tuberculin. Whatever may be said for or against tuberculin elsewhere, in glandular involvement of the neck, it is of undoubted service. One word of warning may I give, and that is, never use tuberculin when the gland is breaking down. The latter seldom if ever disappears, but hardens down to a hard mass, when it is most difficult to remove. Remove the broken down gland first and then treat the rest with tuberculin.

Frequency.

Strange and striking discrepancies occur in the statistics of observers as to the percentage of laryngeal involvement in pulmonary phthisis. I think the numbers vary from 3 per cent. to 97 per cent. Differences in the class of cases may account for some of this disparity, but I think the chief reason is the different views that are held as to what is laryngeal tuberculosis. If this could be settled we would get a more uniform ratio. 30 per cent. in the living and 50 per cent. in the post-mortem room seem to be the most generally accepted numbers.

Heinze	...	...	30 per cent.	
Mackenzie	...	...	33	„
Lamalleine	...	...	44	„
Lubinski	...	...	60	„
Parker	...	...	80	„ { —50 per cent. non-tuberculous. —30 „ tuberculous.
Lockard	...	...	83	„
Schaffer	...	...	97	„

I very much regret that I have not been able to obtain any of Schaffer's writings, as I feel sure he and I must be working on the same lines, only I want to add another 3 per cent. to his estimate.

When I began to examine the larynx of the in-patients of the Melbourne Hospital who were affected with pulmonary phthisis, I was struck with the number of those who presented evidence of healed lesions, some cicatricial, some granulomatous. On fuller investigation I discovered besides such, there was present quite a marked swelling of the mucosa in the region of the arytenoid sulcus. The swelling may be described in appearance as that of a soft infiltration not producing in the early stage any alteration superficially.

It was evidently an early stage of the marked swollen appearance of these parts in the late laryngeal phthisis. There were many cases wherein one would hazard the opinion that the laryngeal trouble was much older than the pulmonary. But what interested me at the time was the fact that in such a number of cases, ulceration had occurred and healed up even though the susceptibility of the patient had not been diminished for any long period. While House Physician at the Royal Chest Hospital, London, I had noted marked improvement and even healing of ulcers of larynx, even though the patients were at death's door, so to speak. In the cases I am now referring to, the change had taken place without any active interference.

Pursuing my investigations further, I found this same swelling in a number of obscure chest cases, and every instance wherein I diagnosed phthisis from the laryngeal appearance eventually turned out to be so.

Now, what is the normal and what amount of departure from that, determines in my mind that it is tubercular infiltration. I will deal with this later at the end of my paper. If I cannot persuade you, perhaps I may set some one of you investigating on the same path.

I am well aware that self-deception is a very easy matter, especially when it comes to a fine point in diagnosis, but I have persuaded myself that in every instance of pulmonary phthisis I can detect some increase in this area. Now, to go one step further.

This infiltration was noted in many cases that came for purely throat treatment—a chronic cough—alteration of voice and symptoms generally of chronic laryngitis, and very often the premonitory symptoms of phthisis, such as lassitude, indigestion, anæmia, and so forth.

On sending such cases to a physician, in some, quite marked physical signs were present in the lungs without any suspicion on the part of the patient of pulmonary affection—in others, early signs were detected, such as prolonged expiration and a suspicion of damping of percussion note—in others again absolutely no physical signs could be elucidated. In this latter class may be mentioned three cases for illustration:—

- (1) Mr. T., a watchmaker, æt. 35, came to me December, 1907, complaining of sore throat. He had a definite infiltration, but no signs were found in his chest. I warned him against continuing his work. He came back in five months with his infiltration further advanced, and this time Dr. Ferguson found some slight signs at his right apex.
- (2) A girl æt. 18, with aphoria, was being treated as a case of hysteria. I advised that early tubercle was present, but no heed was given to the diagnosis. In eight months time she turned up with well-marked physical signs in both lungs.
- (3) An out-patient of Dr. J.F.W., who came to me the other day, three years after I had first seen her and made a tentative diagnosis of laryngeal tuberculosis. Dr. W. found no signs in her chest, and would not even do a von Pirquet, so certain was he that there was no tuberculosis present. She now has well-marked tubercular ulceration of the larynx, though her doctor, Dr. Amess, says that physical signs are still absent from her chest.

You might say that I am justified in my diagnosis of those cases that develop physical signs in the chest, but what of those that do not. To take the group of catarrhal cases; the patients present a chronic inflammatory condition of the larynx, spreading sometimes to the nasopharynx, nose and eustachian tubes. They react to a hypodermic injection of old tuberculin (and stale at that).

They are resistant to ordinary methods of treatment, but react well to a rigid hygienic course, though in some instances tuberculin has had to be used.

In some instances I have found marked enlargement of the cervical glands, though in many cases this has been very slight.

May I give you an illustration:—Dr. P.S. came to me late in his 5th year with marked middle ear trouble. He was out of sorts generally, and could not work, even before his ears became so bad. He had a fair sized pharyngeal tonsil with enlargement of posterior end of inferior turbinate. After a short holiday I removed the adenoid tissue and the posterior enlargement of turbinate. His hearing improved somewhat, but he began to get down again, both as regards hearing and general health. I then noted the infiltration of his arytenoid space, and I put him on injections of tuberculin and he rapidly improved—his appetite was good, and he felt quite able to do his work, and the catarrhal condition of his middle ear was better from 4"—16" hearing (72" in watch).

Every year I get a certain number of senior students and nurses who present the same set of throat and general symptoms—what some have called a hospital throat. Formerly I used to send them away for frequent holidays, but now I find that I can tide them over their period of danger with tuberculin, and once they get away from the hospital and are not exposed to concentrated doses of bacilli, they remain well. One exception I well remember; it was that of a graduate who took a position of locum-tenens at an up-country hospital. She came back thinner, and I sent her to Dr. F., who found an old patch of dullness over the right apex, and we discovered that she had been sleeping in a damp room. Now that she has returned to her old hygiene, she is quite well.

Lockard, still insisting upon a more advanced infiltration than I, writes:—"Many cases of so-called tubercular catarrh are incipient tubercular infiltration. Tuberculin causes increase of hyperæmia and swelling."

As regards the increase of hyperæmia and swelling after injection, it is often fleeting, and in very early cases somewhat difficult to make out (even if you want to).

Which part of the mucosa of the larynx is affected first it is hard to say, but it seems to me that the place where the earliest diagnosis can be made is in the mucosa over and below the cartilages of Santorini. As these approach, a definite bulging affords me a clear indication of implication, though I am not wishing to imply that the mucosa in the sulcus or over the arytenoid cartilage itself is not at the same time equally affected.

Lockard says:—

"*Infiltration* is the earliest and most characteristic of the objective symptoms, and may persist indefinitely without degeneration or development of other signs of local infection.

"Commonly the superficial layers of the mucosa succumb to the constantly increasing pressure of the sub-epithelial exudate, and to gradual obliteration of blood-vessels and the ulcer appears.

"At first the infiltration, if limited to posterior ends of the cords or to interarytenoid sulcus, may strongly resemble simple catarrhal laryngitis, but in the majority of cases there is usually an early extension to neighbouring structures, until the whole larynx is involved with or without concomitant ulceration.

"Infiltration of mucosa of sulcus is the most frequent and pathognomonic localisation of the earlier manifestations of the disease, and often persists unaltered for years."

Sulcus.	Cases.	Sulc. infiltr.	Isolated lesions of sulcus.
Kelly.....	48	34	8
Carmody	81	71	7
Lockard	904	640	79

In the early stages of the disease, the sulcus is partially filled by a circumscribed swelling which forms a convex projection during deep inspiration. It may occupy any part of incisure; usually in middle,

more seldom on one side, impinging upon corresponding cord, and occasionally upon each side, giving to the middle part a sunken pinched-out appearance.

In simplest type it forms a broad based, more or less elevated red or grayish-white projection, covered by smooth or slightly uneven epithelium.

Slide No. 1.

When I began to read Lockard's work, I thought he and I were referring to the same infiltration, and I could not understand why his percentage was so low. When I came to his illustrations, however, it was very evident that he was referring to a very much advanced condition from my point of view, and now I cannot understand how his percentage is so high, for in my experience such a condition is much more rare even in fairly advanced cases.

In nearly every book the illustrations of the normal larynx exhibit uniformly what I make bold to term, early tubercular infiltration of larynx. Take that excellent work of McBride, for instance—this is his illustration of the normal larynx—

Slide No. 2.

A typical case of early tubercular infiltration, and not so very early at that. Below I have reproduced the same illustration thinned down to what I consider is the normal appearance of the larynx on the left hand, and very early infiltration on the right.

Slide No. 3.

Here is an illustration of the larynx as given by Schmidt; and for this and the purely anatomical slides that follow I have to thank Professor Berry, who as usual, is only too glad to place any material at the School of Anatomy, at the disposal of stray interlopers like myself, whom I fear are only too ready to borrow. I feel I am only doing my duty in paying him and Dr. Anderson and the zealous band of co-workers he has gathered round him, a small tribute of thanks for the infinite care they take to oblige.

You see here a good representation of a larynx with a little infiltration.

Slide No. 4.

Once you accept my statement of "early infiltration," two difficult matters to understand are cleared up.

(1) *Alteration of voice* (an acknowledged early symptom of phthisis) has been attributed to—

Muscular weakness.

Expiratory insufficiency.

Paralysis of recurrent laryngeal—

(1) Bronchial glands.

(2) Tubercular Neuroma.

Atrophy of laryngeal muscles with fatty or waxy degeneration.

Infiltration of vocal cords.

With the exception of perhaps the first two, none of these causes are often at work in early phthisis, and in very early cases, I doubt if either of them could be seriously entertained, and surely not in pre-pulmonary cases.

Yet this peculiar alteration in voice—which is neither hoarseness nor huskiness, but a weakening or muffling or damping with a soft pedal—has often been observed by me in cases quite free from pulmonary signs. If you accept my view of infiltration of arytenoid and interarytenoid mucous membrane, it is easy to see that the difficulty arises from the impediment caused by the heavy mucosa.

The alteration in the voice is hard to describe, but I dare say you are all quite as aware of it as I. It is almost pathognomonic, and if you look out for it, you can make a rough and ready diagnosis of tubercular infection. I remember once meeting a student in the train, and he said, "I have been wanting to come and see you, Dr., and have my throat attended to. I think I have post-nasals, or something." From his voice I was suspicious. He had well marked sulcus infiltration. He reacted violently to tubercular infection, and he had a bad family history. Up to the present, however, he is doing well.

(2) *Ulceration*.—The occurrence of "erosion" ulcers, which has not been made very clear by previous explanations, can be watched in the process of formation by the "rucking" up of the thickened mucosa in the centre of the sulcus. This not only accounts for the centrally placed ulcer, which is the commonest, but also for the less often observed ulcers which are laterally placed in the sulcus. The other position is anterior to the arytenoid cartilages. Its formation is still less satisfactorily explained by the ejected sputum theory. I have watched one forming by the apposition of two swollen arytenoids. The great swelling of the arytenoid mucous membrane has always been attributed to the ulceration, but in my opinion a fair amount of swelling is always present previous to ulceration caused by erosion.

Vocal cords.—Early tubercular infiltration of the vocal cords is of an indolent type of catarrh—at first generally unilateral—the swelling is soft to appearance and of dull raw beef colour. It begins in the region of the vocal process, and seems to be an extension of the infiltration of the arytenoid mucosa, as a rule.

Epiglottis.—Infiltration of the epiglottis is to my view, much later than that of the sulcus and arytenoid region. Though I have several times seen marked affection of the epiglottis long before any physical signs have been detected in the lungs.

False vocal cords.—A slight infiltration will sometimes be seen quite early in this region, but it is always later as far as I can judge, than the sulcus; that is to say, I have never seen it without marked infiltration of the sulcus, even though when very slight.

Slide.

Treatment.—In all cases the most important factor is hygiene; the same as is laid down and practised for pulmonary phthisis, with this addition—as complete rest as possible for the larynx—no talking nor whispering to be allowed. This must be insisted upon rigidly in all but the very earliest cases.

As regards medical treatment, I still pin my faith to lactic acid, where there is ulceration; beginning with weak doses and quickly rising as it may be time, up to full strength. I think why lactic acid is not more universally used, is because it is not used thoroughly enough.

The galvano-cautery puncture as recommended by Dr. Dundas Grant, is very useful where œdema is marked. I have not used it upon ulcers, though he seems to be advocating its use more and more.

Surgical interference I have never freely employed; in fact I do not believe I have opened my case of Heryng instruments for two years. I do believe, however, in excision of the epiglottis when it causes dysphagia, if its condition is not quickly improved by lactic acid. Its removal is not difficult and causes no trouble in deglutition, in fact, it never is missed, and even in those who are near to death's door, the relief it affords is well worth the little disturbance its removal causes.

An important question as to diagnosis.

Can you form any diagnosis from the infiltration? Yes, I think you often can, though I do not know that I can easily convey to you what I mean. There is in some cases a certain appearance of activity about it that suggests rapidity of onset and gross infection or small resistance. It is interesting also to note how quickly the infection increases as a case goes quickly down hill, long before there is any central ulcer or suspicion of lateral ulceration; before there is any complaint of pain or reference to laryngeal discomfort; although this latter may be present in very early cases.

It is easy to watch also the amount of infiltration recede as the patient gets better.

Two cases afford an illustration.—A young medico, who thought he was cured and was pronounced free from physical signs in the lung, was examined by me as his voice was distinctly "tubercular." I found an infiltration that suggested some activity, and as he was coming to Sydney, I advised him to see Dr. Sinclair Gillies, who found definite physical signs.

A nurse was sent to me by Dr. Mackay, and I diagnosed a probable bad case of tubercle bacilli infection. She had, I was then told, been away for three years on account of an early pulmonary affection, and had only been back in the hospital a month.

DISCUSSION.

Dr. A. L. KENNY (Melbourne)—We use several weapons of our armoury, rarely one alone, therefore the assessment of the value of a particular drug or method is difficult. Rest is all-essential. General hygiene to be attended to on lines of pulmonary tuberculosis. Can hardly realise the existence of laryngeal tuberculosis without pulmonary tubercular disease. Early cases may fail to give *detectable* signs. Lactic acid pure is most useful. Galvano-cautery puncture in hypertrophic cases. Tuberculin has not been *very* successful. Old tuberculin and tracheotomy were disastrous remedies, and the latter should not be revived. Sir Almuth Wright has demonstrated the potency for ill of tuberculin when administered without Opsonic Index control.

Dr. GUY GRIFFITHS said: I would like to say a few words on Dr. Camac Wilkinson's method of treating tubercular laryngitis. He uses pro-

gressive doses of tuberculin—progressing ultimately, if possible, to $\frac{3}{4}$ cc., or even 1 cc. of P.T.—and no local treatment of any kind; rest of the voice and general hygiene he of course advised, but no special climate.

Laryngeal lesions associated with pulmonary lesions and tubercle bacilli in the sputum, are not to be considered tuberculous unless either tubercle bacilli are found in laryngeal tissue or the lesions are seen to react to inoculation of tuberculin.

In many cases the results are astonishing, both at the time and permanently; as however, most of the patients whom he has treated suffered also from advanced pulmonary tuberculosis, it is necessary to test the patients from time to time, say every six or twelve months, and repeat the treatment in case of reaction. I am afraid that the successful cases other speakers have reported to-day will not be likely to prove permanent unless this precaution be adopted. Patients who neglect testing and retreatment are liable to relapses. Again too, the intercurrent of another disease, e.g., malaria, measles, influenza, may lead to a recrudescence. However, I have seen a number of patients treated by him, some six or eight years ago, one more than ten years ago, who have remained well, although originally they had loss of voice, in several cases complete loss, extensive ulceration, either interarytenoid or on the cords themselves, and swelling or ulceration of the epiglottis.

I have treated others according to his system and have had, usually, good results, though the length of time is not yet sufficient (three or four years only) to say whether the results will be permanent.

Of course, where the patient is emaciated and the pulmonary disease in the third stage, especially if ulceration of the posterior surface of the epiglottis interfere with swallowing, good results are scarcely to be expected, and failure is more likely to follow than success.

Dr. JOHN MURPHY (Melbourne) said that during the past twelve months he had treated several cases (which did not respond to rest and the usual hygienic treatment) by giving tuberculin.

He was led to use tuberculin by reading Dr. Camac Wilkinson's work, and he could say emphatically that he regarded tuberculin as the sheet-anchor of treatment in tubercular laryngitis. His results in the cases treated by this method during the past twelve months were almost all uniformly good.

He did not believe in local applications of lactic acid to the larynx—he had not seen any benefit come of it.

Where tubercular tumours formed he anæsthetised the throat and, with the aid of direct laryngoscopy, removed them with Patterson's forceps.

Drs. Kirkland, Gibson, Marks, Sinclair Gillies, and Palmer also reviewed the paper.

NASAL OBSTRUCTION—ITS SURGICAL TREATMENT.

By JOHN MURPHY, M.D., F.R.C.S., I.

It is a well-known fact that any organ or part of the body that is not used does not develop properly.

This is well exemplified in the nose, especially in young children where the nasal passages are narrow and obstruction easily occurs; not only is the nose affected, but the upper jaw, palate, and other parts are also poorly developed in these cases. We see here the high arched palate, narrow upper jaw, and crowding together of the teeth.

The obstruction may be complete or incomplete, intermittent or continuous; as a rule it is incomplete and intermittent, and in any case it seriously interferes with the functions of the nose—that of warming, moistening, and filtering the inspired air, and by interfering with the sense of smell it also affects the sense of taste; and when mouth-breathing has become the rule, the vocal and respiratory functions are impaired, drainage and ventilation of the accessory sinuses, the Eustachian tube, and lachrymal duct are also difficult.

The nose might be termed the defender of pharynx, larynx, and lungs.

The vascular erectile tissue on the inferior and middle turbinates and on the lower anterior part of the septum supplies the heat and moisture by which the air is raised to body temperature and saturated with moisture before the pharynx and larynx are reached. St. Clair Thomson states that in twenty-four hours over a litre of water is supplied by the nose to the inspired air.

The vibrissæ at the entrance of the nose strains off the dust and germs that are inhaled, and any microbes and dust getting past these are caught on the mucous membrane of the nose covered with ciliated epithelium, and bathed with mucus, and are carried forward out of the nose. It has been shown that nasal mucus has an inhibitory action on pathogenic bacteria.

Bearing in mind the functions of the nasal mucous membrane, it is well to be conservative in dealing with it—in treating patients with nasal obstruction.

It is better to be a partial mouth breather than have free nasal respiration with these functions destroyed.

The mouth-breather inhales germs and dust which chiefly lodge in the mouth and pharynx and are enmeshed in saliva and swept into the stomach. Around the pharynx we have a line of defence—Waldeyer's ring, in front and below the lingual tonsil, laterally the faucial tonsils, and above and posteriorly the pharyngeal tonsil, and also a small tonsil on the posterior lip of the Eustachian tube.

Here is a line of defence—lymphoid tissue for the respiratory and digestive tracts. Leucocytes come out through the tonsillar epithelium and attack and kill inhaled germs and return with their dead bodies as food, but frequently the leucocyte is killed by a virulent germ in a patient whose opsonic index for that germ is low—whose vitality is below par. The germ remains on the tonsil, multiplies, and the tonsillar ring is frequently the point of inlet of many bacteria, especially tubercle; and

it is generally believed that chronically enlarged tonsils and adenoids have, to a large extent, lost their defensive power, and patients with these are more liable to infectious diseases, *e.g.*, diphtheria.

The symptoms and signs of typical nasal obstruction are well seen in a child with well-marked post-nasal growths, which lead to swollen oedematous lining of the nose, with secretion of an excessive amount of mucus. The child instinctively tries to breathe through the stenosed nostril; the result is the walls are sucked together and obstruction becomes complete; breathing is distressful, especially during sleep, for although the mouth is open, the child instinctively tries to breathe through the nose—hence snoring, restless sleep, dreams, morning headache. Owing to the impeded airway chest deformities occur, especially in rickety children; the negative pressure in the chest is not quickly overcome by a free inlet of air from the nose, hence chest deformity—pigeon breast, depression along the attachment of the diaphragm, Harrison's sulcus, indrawing of the lower end of the sternum, and winged scapula.

We are familiar with the face of nasal obstruction—called the adenoid facies—the open-mouthed, silly appearance.

Of course, the adenoid facies may occasionally occur in children without nasal obstruction, and adenoids and nasal obstruction may be present without the adenoid facies.

The voice of the mouth-breather is dull, he is frequently deaf, and owing to the fact that he is inhaling cold, unfiltered, and unmoistened air, he is subject to repeated colds, cough, affections of the larynx, trachea, and bronchi—the cough may be due to these affections or to the presence of mucus in the pharynx and naso-pharynx, or it may be due to reflex irritation from the cause of the obstruction in the nose. The impeded respiration leads to deficient aeration of the blood—hence dulness of intellect, lassitude, anæmia, muscular weakness.

A varied series of symptoms may arise when the nose is obstructed—dry mouth and throat, dental caries, tonsillitis, inflammation of the respiratory tract, and deficient chest expansion, stammering, stuttering, laryngismus stridulus, hay fever, chorea, epilepsy, and gastric catarrh, headache, and neuralgia—any one of which may be relieved by removing the cause if present in the nose or naso-pharynx.

Neuralgia is frequently caused by enlarged turbinal bodies pressing on the septum' or deflected septum pressing on the side of the nose. Where the nasal obstruction persists from childhood, the nose is badly developed the passages may be narrow, with septal deviations, spurs, or crests, and turbinal hypertrophies accompanied by catarrhal condition of the pharynx and larynx.

Changes in the physiognomy are marked if nasal stenosis occurs before puberty. At first with mouth breathing you get instinctive nasal respiration, with good action of the dilators of the nares; later, when mouth-breathing is well established, the dilator muscles atrophy from want of use, and the orbicularis ones lose tone owing to the open mouth, consequently the lines around the nose and mouth disappear, the face becomes smooth and expressionless, and the anterior nares are collapsed and appear as mere slits.

Nasal obstruction leads to diminished drainage, stagnation of nasal secretion, lowered resistance and tendency to infection of the accessory sinuses. The tendency to chronic naso-pharyngitis is due to diminished ventilation and weakened defence.

Infections of the middle ear are a frequent sequel of nasal stenosis—it is imperfectly ventilated, and its mucous membrane is kept congested and its secretions are imperfectly drained off.

Hypertrophy of the posterior end of the inferior turbinate may block partly the pharyngeal orifice of the Eustachian tube.

Sometimes patients with too free nostrils complain of nasal obstruction: they do not feel the air passing through the nose. Hysterical people think sometimes they cannot breathe through a free nose. Often after the removal of an old nasal obstruction the patient is unable to breathe comfortably through the nose—he has lost his nasal breathing instinct and has to be re-educated to use his nose by keeping the mouth shut voluntarily for a definite time each day; or with children, the chin should be pushed up during sleep and kept up, if necessary, with a bandage. In examining a patient with nasal obstruction, do so first without a speculum—look for alar collapse.

Insert speculum, If see obstruction, feel it with a probe—it may be a deviated septum, spur, or crest, hypertrophied turbinal bodies, new growth in the nose, or congenital occlusion—do posterior rhinoscopy,

Now cocaine the nose—this will cause shrinking of the mucous membrane, and a much better view can be obtained. If pus is visible, transilluminate, and if dull over any accessory sinuses, explore them with a needle and irrigating syringe.

If the condition is one of hypertrophy of the turbinal bodies generally, the inferior, and if on applying cocaine a free passage is obtained, the obstruction may be corrected by cauterisation or removing with scissors part of the hypertrophied mucous membrane; if polypoid, it may be necessary to remove with scissors and snare the anterior end, and with snare or spokeshave the posterior end and part of its intervening hypertrophic mucous membrane. There is no necessity to ever remove the whole inferior turbinate; its function is important, and as much should be left as is consistent with a free passage through the nose.

The middle turbinal body when hypertrophied is often a bony hypertrophy, and may be the cause of asthmatic or neuralgic troubles, by pressing on septum. Its hypertrophied part may be removed by scissors and snare and forceps.

If the septum is deflected we do a submucous resection, but here again only remove as much as will give a free passage to the nose—it is rarely necessary to do a complete resection. I frequently raise a flap of mucous membrane and take a slice of cartilage with a knife and saw off any projecting piece of bone. In obstruction where the septum is not badly deviated, it is necessary to remove all the deviated part, especially the lower part and generally the spine and crest of the superior maxilla.

With deflection of the anterior part of the septum the submucous resection of the deviated part gives relief. One has to use one's judgment

in freeing an obstructed nose; it is often necessary to do a partial or complete resection of the deviation and remove the anterior or posterior part of a hypertrophied turbinate.

In operating in the nose one must always guard against producing a too free nose which will not warm, moisten, and filter the air sufficiently, and will lead to further trouble.

With regard to polypi of the middle turbinate and the rest of the ethmoid. The removal of the polypus is an incomplete operation. In nearly all cases there is ethmoidal disease, and often empyema of the sinuses—these should be examined carefully and treated in every case of polypi of the nose. Moreover, polypi should be examined microscopically to detect early sarcoma, a not infrequent sequela of polypi of the nose.

In children and young adults the removal of adenoids and enlarged tonsils will cure the nasal obstruction in the great majority of cases. It is remarkable the way in which hypertrophic rhinitis will disappear when adenoids and enlarged tonsils are removed.

Spurs and crests should have the mucous membrane stripped off them—they are then removed by the knife or saw or chisel, and then the mucous membrane flap should be replaced.

Every deformity of the septum or turbinal bodies of the nose does not call for treatment; so long as there is no obstruction or pressure symptoms it is well to leave them alone. It is only when there are signs of obstruction or symptoms due to pressure causing neuralgia, asthma, headache, &c., or blocking of the opening of accessory sinuses, that it is necessary to interfere, and if interference is necessary, do it early to prevent the numerous sequelæ of nasal obstruction.

DISCUSSION.

Drs. Marks (Sydney), Gibson (Brisbane), Arthur (Sydney), and Nolan (Sydney) spoke.

DR. JOHN MURPHY (Melbourne) in reply to the question of the Chairman regarding the treatment alar collapse said that prophylactic treatment was important, that is the early removal of the nasal obstruction of which atrophy of the dilators of the nose and alar collapse were a result.

Where alar collapse is established, relief may be obtained by wearing a wire dilator inside the nostril.

Deviations of the septal cartilage should be rectified by submucous resection, and where alar collapse is marked, a small strip piece of the septal cartilage may be detached below and rolled up and thus used as a submucous prop to hold out the collapsed ala.

Max Halle, of Charlottenberg, advises the submucous resection of the upper part of the alar cartilage where this is excessively curved and near the septum, also the lower end of the cartilage if this is near the septum.

Menzel advises paraffin injection into the collapsed wings.

Eckstein advises the subcutaneous insertion of a wire in the ala, entering at the sulcus alaris, passing along the free edge of the ala to near the tip of the nose, here it is reintroduced and carried to near its point of insertion, thus a triangular wire is buried in the tissues and prevents alar collapse.

Another method is to subcutaneously insert a fine silver support in the ala with the convexity outwards. The points which I have emphasised in my paper were :—

- (1) The necessity of a thorough examination of the nose to detect the real cause of obstruction.
- (2) The observation of alar collapse and its treatment.
- (3) The conservation of as much mucous membrane as possible in all nasal operations.
- (4) The advisability of leaving deformities in the nose alone unless causing obstruction or pressure symptoms.
- (5) The removal of only as much of the septum as will produce the necessary clear airway and relieve pressure.
- (6) The fact that it is bad surgery and never advisable to remove the whole inferior turbinal body.
- (7) Where operation is necessary in the treatment of nasal obstruction, the early performance of it to obviate the numerous pathological consequences.

For the specimens illustrating different forms of nasal obstruction, I have to thank my friend and colleague, W. C. Mackenzie, M.D., F.R.C.S., F.R.S.E., Lecturer in Applied Anatomy in the University of Melbourne.

TREATMENT OF AURAL SUPPURATION BY MEANS OF VACCINES.

By R. SPENCER GODSALL, F.R.C.S., E.

I WOULD like to briefly bring under your notice a short series of cases of aural suppuration treated with vaccines prepared from organisms isolated from the discharge.

All the patients have been treated by ordinary methods for varying periods without effect.

All cases were specially selected as suitable for vaccine treatment owing to the fact that all were carefully examined for traces of cholesteatoma; and, if these were found, the case was considered unsuitable.

The series consists of fourteen cases, of which nine were males and five females.

The ages of the patients varied from 15 to 40 years, and duration of discharge from 1½ to 17 years. In nine cases the disease was unilateral, and in five bilateral. A variety of organisms were isolated. In two cases a mixed vaccine was given; in the remainder the predominant organism alone was cultivated and injected.

In the following six instances the injections were controlled by reference to the opsonic index:—

Two tubercle bacillus.

One staphylococcal.

One bacillus coli communis.

One diptheroid.

In the tubercle bacillus cases, 1/1,000 m.g. T.R. was given for three injections at three to five days interval, and then 1/500 m.g. T.R. for three injections at three to six days' interval. In the remaining cases, the initial dose was 200,000,000 bacteria every fourteen days, rising finally to 500,000,000 per injection.

The minimum number of injections was four, the maximum six, so that treatment varied from eight to twelve weeks.

During the vaccine process, all other methods of treatment were suspended except syringing the ear with weak boracic lotion.

Here followed the technique of obtaining the discharge, the preparation of the vaccines, the estimation of the strength of the vaccines, and the method of injection.

The results of the treatment were disappointing. Two cases improved considerably, but were not cured. Four cases were set down as doubtful. Although the patients expressed themselves as much better, I could not satisfy myself that any marked improvement in the local lesion had taken place. In the remaining eight cases, the condition was unaltered.

In the recent literature on this method of treatment, one finds several workers reporting favourable results. The most notable series is that of Dr. Nagle, reported in the American "Journal of Laryngology," in which she reports forty cases with only one failure. Some of her cases were under treatment for eighteen months, and in some, large sequestra came away during treatment.

Other workers report cures in from seven to forty-eight days. On the other hand, several workers have had very unsatisfactory results.

Of the cases showing improvement, it will be noticed that the disease was of comparatively recent origin. In the chronic cases no change seems to have been effected.

One case I would like to mention as showing the need of caution in ascribing a cure to vaccine treatment:—J.G., aged 35, had had a discharge from the right ear for two years. I considered this a suitable case for vaccine treatment, and isolated the diplococcus pneumonia from the discharge in pure culture.

In the meantime I curetted some granulation from the middle ear, and applied nitrate of silver to the cavity. This treatment was supplemented with biniodide in spirit drops. In four days the discharge had ceased, and has not recurred during the last six months. In this case the vaccine was never used. If it had been, I would have been inclined to ascribe the sudden cure to this agency.

TREATMENT of Aural Suppuration by means of Vaccines.

Cases.	Age.	Discharge.	Dura- tion.	Ear Affected.	Op. Index.	No. In- jects.	Re- act.	Result.
J.S. ...	40	Staph. and Strep. ...	17	R. ...	...	6	+	Nil.
W.T. ...	26	Staph. ...	2	L. ...	...	6	+	Improved.
H.L. ...	19	do ...	6	R. & L. ...	0.1	6	+	Nil.
G.M. ...	18	Staph. and Strep. ...	1	R. & L. ...	...	6	+	(?)
M.T. ...	35	Diphtheroid ...	3	L. ...	0.1	5	+	Nil.
V.O. ...	30	do ...	5	L. ...	...	5	+	Nil.
H.H. ...	18	do ...	2	R. & L. ...	...	5	—	(?)
H.T. ...	32	Bac. Coli. Com. ...	6	R. ...	0.1	6	+	(?)
O.L. ...	20	do ...	5	R. & L. ...	...	6	—	Nil.
L.G. ...	22	Pneumo-coccus ...	1½	L. ...	...	4	+	Improved.
H.V. ...	38	do ...	4	L. ...	...	4	+	(?)
G.N. ...	16	Tubercle Bac. ...	4	R. & L. ...	0.1	6	+	Nil.
L.B. ...	15	do ...	7	R. ...	0.1	6	+	Nil.
M.S. ...	17	Strep. Pyrogenes ...	2	L. ...	...	4	+	Nil.

ON TWO CASES OF MIDDLE-EAR DISEASE TREATED BY HEATH'S METHOD, AND A CASE OF INTERNAL EAR DISEASE TREATED BY "606."

By G. H. HOGG, M.D.

I WOULD desire to draw your attention briefly to three cases of ear disease which may be of some interest. The first two to illustrate the good effect which may occasionally be obtained by the method of treatment introduced by Mr. Charles Heath in certain cases of middle ear disease, and the third the good results obtained in a case of syphilite ear disease by use of salvarsan when other remedies have proved useless.

Heath's method consists, as you are aware, in painting solutions of cantharides on the drum of the ear.

At first Mr. Heath used liquor epispasticus diluted 1 in 10, 1 in 8, 1 in 6, 1 in 4, and 1 in 2. He now recommends a preparation of—

Cantharides, gr. i.

Pot. hydroxide, gr. i.

Water, m. 300.

Dilute with equal parts of glycerine and water to the proper strength.

The paint should be applied daily, beginning with the weakest, and gradually increasing the strength until the strongest is used. It causes a little pain at first, but this does not last long, and after the first few applications even this is not noticed. There is a tendency for crusts to form after a time, but these eventually loosen and come away.

The treatment should be carried out for at least a month, and second and third courses may be necessary.

Case 1.—Male, aged 27 years, suffering from deafness and tinnitus, more especially in the right ear; in the left ear there was long standing middle-ear suppuration with almost complete destruction of the drum.

In the right ear the drum was lustreless, thin in patches, and one of these patches equal to nearly a quadrant of its area ballooned out on inflating the middle ear. The hearing of this ear was very much reduced; he could hear the watch only on contact, and a loud voice at 2 feet; the bone conduction was good.

The drum was painted for six weeks; at the end of that time the watch was heard at 7 inches, and a low voice at 3 feet.

After another month, great improvement had taken place; the watch was heard at 9 inches, and a loud voice at 20 feet, and a whisper at 6 feet; tinnitus had almost disappeared; the drum had a more natural appearance. It was thicker, and the ballooning patch was not to be seen.

The patient expressed great satisfaction, and stated that the confusion and deafness which had been so troublesome to him in his daily life had disappeared.

Case 2.—Female, aged 53 years, has suffered from dry middle-ear catarrh for many years, and has undergone all kinds of nasal and aural treatment.

Hearing of Case 1, she expressed a wish to have a trial made, although I held out no hope of improvement to her.

She can only hear when one shouts close to her ear; even then she is in doubt at times, and tinnitus is troublesome. As she could not come regularly, treatment, which was occasionally interrupted, was carried out in one ear only.

After six weeks, however, she could hear an ordinary voice at 20 feet. She states that she can now hear the clock ticking, which she has not been able to hear for years, and provided that people speak distinctly she can hear them without their shouting. She now wishes the other ear to be treated.

Case 3.—Male, aged 38 years, complains of rapidly increasing deafness and tinnitus. There is a history of specific disease twelve years before which was treated for a year or more. Some two years ago he had his deflected septum operated on by an ill-advised operator, which interference apparently lit up the dormant disease, and resulted in extensive necrosis of the nasal bones and perforation of the palate.

In the right ear the watch was heard at 4 inches; in the left ear the watch was heard on contact. The bone conduction was diminished, and high notes were not heard so well as low notes.

The tubes were patent, but inflation of air did not improve the hearing; occasional giddiness and headaches were complained of. Although mercury and iodides were pushed and continued for some time, they apparently had no effect on either the nose or ear trouble. The throat and palate condition healed eventually under the use of iodopin, and this drug seemed to benefit the nose slightly.

Salvarsan 0.5 gr. was given subcutaneously, and within a week the patient stated that tinnitus had disappeared, and that the hearing had improved.

In 10 days, in the right ear, a watch was heard at 20 inches.

In 10 days, in the left ear, a watch was heard at 10 inches.

In 30 days, in the right ear, a watch was heard at 60 inches.

In 30 days, in the left ear, a watch was heard at 15 inches.

In 60 days, in the right ear, a watch was heard at 60 inches.

In 60 days, in the left ear, a watch was heard at 30 inches.

The nose had improved considerably; the foul smell had disappeared, and the copious foul discharge had stopped, although the nose was far from healed.

Recently there have been signs of a relapse of the nasal trouble, and to a far less degree of the ear trouble, although the hearing continues good.

We know that "606" has been blamed for causing ear mischief, but in this case, where the internal ear was involved, and deafness had rapidly increased notwithstanding the free use of mercury and iodides, it had a rapidly beneficial effect.



